# ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Vol. 9. No. 6. WEEKLY. | NEW YORK, SATURDAY, OCTOBER 9, 1886. | $3 per annum. Single Copies, 10 Cents.



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Entered at Post Office, New York, as Mail Matter of the Second Class.


### The Brightman Stoker as Applied to the Zell Boiler.

In our issue of Jan. 30, 1886, we presented our readers with a description of the Brightman furnace, and in our issue of Jan. 2, 1886, we illustrated and described the Zell safety boiler.

Our illustration on this page shows the Brightman stoker as used in combination with the Zell boiler.

By use of this mechanical stoker cleanliness and economy of both fuel and labor are attained—advantages which are of highest importance in electric lighting stations.

With the Brightman stoker little or no smoke is produced. The automatic feeding device supplies a regular and uniform amount of coal to the grate, the gases are generated uniformly, and the fire is kept at an even and uniform temperature to consume the combustible gases.

The operation of the furnace will be readily understood by reference to the accompanying cut. The coal is thrown into a hopper conveniently located along the boiler front, or where two or more boilers are arranged in battery the hoppers are filled by a mechanical conveyer.

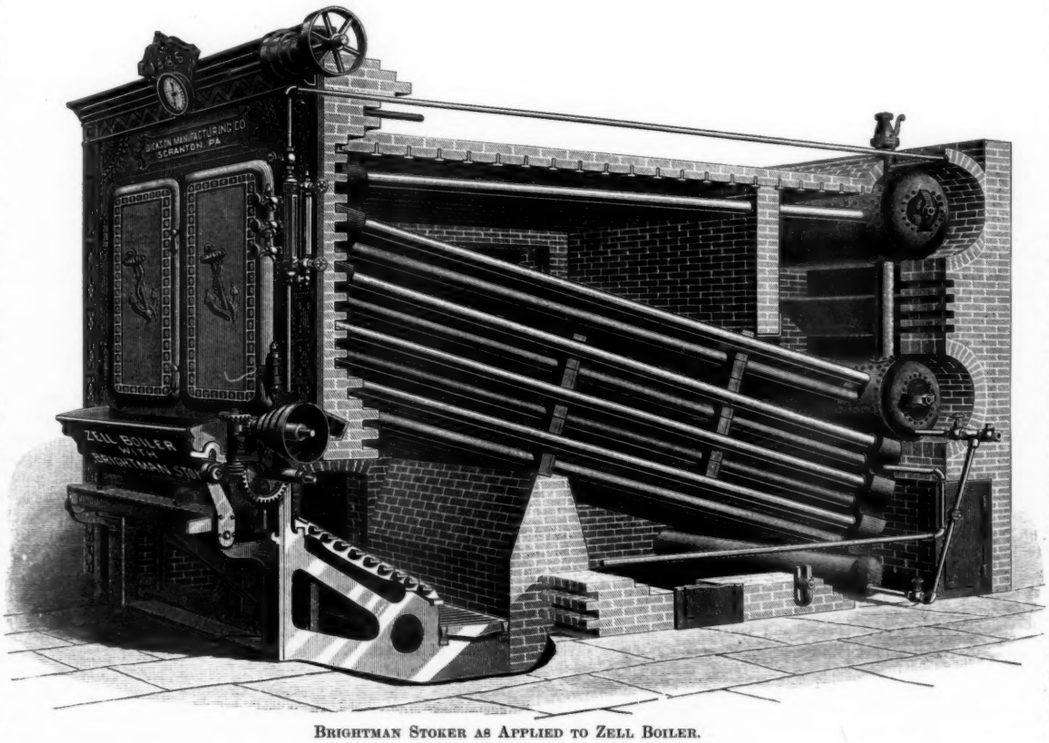
From the hopper the coal is fed evenly and in small quantities to the front part of the grate bars, and without causing any opening through which cold air can enter over the fire.

The grate bars are inclined to the horizontal, and each alternate grate bar is kept in motion longitudinally. This motion combined with gravity causes the fuel to move regularly to the rear end of the furnace. This movement is positive and may be varied according to the demand for steam.

No clinker can collect on the grates, but is carried forward to the supplementary grate, from which it is removed with other refuse.

The Zell safety boiler with which the stoker is shown in combination for coal economy, absolutely dry steam, compactness and completeness in detail, has become well known to the engineering public.

The Zell Engineering Co., 112 Liberty street, N. Y., are the general Eastern agents for the Brightman mechanical stoker, which they are prepared to apply to any type of externally fired boiler and guarantee an increased economy of 15 to 25 per cent., according to kind of fuel and kind of boilers. This stoker has been largely introduced in the West with good results, and the Zell Engineering Co.—which is composed of competent and experienced engineers, are prepared to put in this stoker in combination with the Zell boiler, guaranteeing an economy superior to any other system on the market. The Zell Company are equipping the Harlem Illuminating Co's station with a complete steam plant of 300 horse power—including the Brightman mechanical stoker.




BRIGHTMAN STOKER AS APPLIED TO ZELL BOILER.

### The World's Production of Copper.

The production of copper throughout the world last year is estimated at 221,715 tons, as compared with a corresponding production of 217,483 in 1884, and 153,057 in 1880. The largest copper-producing countries last year were Australia, 11,400 tons; Chili, 38,800; Germany, 15,250; Japan 2 000; Spain and Portugal, 45,949; and the United States, 74,050.

—— A communication from C. A. Leffingwell, proprietor of the Shreveport (La.) Electric Light and Powder Works, have been received by the mayor of that city, representing that as the city authorities of Shrevepor. will, on the 9th of this month, consider the question of lighting the city with electricity, and as the matter is somewhat new there, he desired the mayor's opinion concerning the practicability of street lighting by electricity as compared with other artificial lights. His Honor very sensibly replied that for street lighting electricity was preferable.

### The Great Northwestern Telegraph Company.

At the annual meeting of the Great Northwestern Telegraph Company, at Toronto, September 29, Erastus Wiman was re-elected president. The business of the company showed a very considerable diminution, owing to the completion of the Canadian Pacific Railway Telegraph. The shareholders resolved that in paying the rental to the Montreal Telegraph Company, under contract with the Great Northwestern, it should be called upon to defend its exclusive contracts with the various railway companies, which were handed over to the Great Northwestern, but which have since been acquired by the Canadian Pacific company, who are now doing a competitive business over these lines.

### The Electric Railroad at Los Angeles, California.

A reporter interviewed Mr. W. H. Workman for a few moments in regard to the First street electric railroad at Los Angeles. Mr. Workman said that the greatest drawback of the work was at last overcome. This consisted in the grading of the steep Boyle Heights hill, on First street, beyond the river, which has for quite a while interfered with the tracklaying. The track is already laid from Main street to the river on First street; and the bridge over the river is also completed, though the rails are not yet laid on it. Tracklaying will now be immediately commenced, and will be completed within thirty days to the top of the hill. Col. Howland will have the electric gear in running order within an equal number of days. One car has already arrived, and is waiting active service at the Naud warehouse. The others are on the road, and may be expected within two weeks. The city terminus of the line is opposite the Nadeau, corner of Spring and First streets, and the opposite end is Evergreen cemetery. The City Council lately granted Mr. Workman an extension of time of six months to complete the road in; but now that the grading of First street hill is overcome, he is hopeful of being able to complete the whole work in ninety days. As soon as the work is totally completed to the top of the hill, the cars will begin to run to that point, and they will gradually increase the distance as tracklaying is completed nearer the cemetery.

### Electricity and Farming.

We have heard it remarked, says an exchange, that the wonderful discoveries recently made in the line of electricity do nothing to directly encourage farming. But it is as true in farming as in any other occupation, those men who are on the alert for discovering and making practical application of all the knowledge to be had, whereby the various labor occupations may be made easier, are the ones that will be at the head and make the most money. And to the farmers of the future who will lead in the ranks of competitors we commend the following result of an experiment made by Professor Hodefleiss: Plates of copper were thrust upright into the earth, and connected by wires with similarly-placed zinc plates about 100 feet distant, an electric battery being thus formed, with the earth between the copper and the zinc in the circuit. Both potatoes and beets planted between such plates gave an increased yield—beets, 15 per cent.; potatoes, 25 per cent.—as compared with other parts of the same field.

—— The Consolidated Electric Light Company, of this city, has contracted to place 400 of their popular Sawyer-Man lamps in the large dry-goods jobbing house of Shotwell, Clerihew & Lothman, of Minneapolis, Minn. This will make quite a fine incandescent plant.

### Electrified by the Earthquake.

Dr. B. F. Wyman, of Aiken County, S. C., makes the following statement concerning the peculiar effects of the great earthquake on the night of August 31st, upon the Rev. W. H. Mosely, a Methodist minister of that county.

"Between 12 and 1 o'clock on the night of August 31st, I was called to visit Mr. Mosely, who had been taken suddenly sick during the first shock. I found him in bed talking cheerfully. He told me at once that he was not sick; that he never felt better in his life; that just preceding each shock of the earthquake he was seized with a peculiar tingling sensation, beginning in his toes and feet and gradually extending to his limbs and whole body. While speaking he suddenly screamed out, 'Another shock is coming.' At the same time he grew red in the face and all the muscles of his body became convulsed and drawn, and he appeared as one under a great strain or receiving an overcharge of electricity from an electric battery. A singular fact connected with all of these attacks was that he became aware of the approach of a shock a considerable period of time before other members of the family. Another singular fact that I observed was that while the shock was at its height and the house and furniture were rocking and rattling, his muscles became relaxed, the attack passed off and he declared himself as feeling all right and was calm and cheerful. He was certainly suffering from an overcharge of electrical fluid upon an excited and overstrained nervous system."

### Am-meters.

The following is a brief description of the general construction and mode of using the direct-reading am-meters, volt-meters and volt-am-meters, made under A. K. Eaton's patent of January 22d, 1884:

The volt-am-meter represented in the figure has within the upright cylindrical body an elongated bobbin wound with face wire, which, when the circuit is passed through it, actuates the annular needle, deflecting it more or less, according to the tension of the current. Outside of the graduated circle is an annular magnet which governs the needle, tending to hold the poles of the latter in the same line with those of the governing field ring magnet, and cutting off practically the effect of terrestrial magnetism and eliminating the effects of local magnetic disturbance. The annular magnet moves freely around the graduated circle, carrying a vernier which reads to one-tenth of a division. The vernier, however, is attached to a brass carrying ring upon which the magnet rests, and to which it is firmly attached when in use. By means of a small binding screw, not seen in the figure, the annular magnet may be adjusted so as to make the needle pointer and the zero points of the graduated circle and vernier to correspond under any ordinary conditions of local disturbance. The body of the instrument also contains a strong bar of copper, connecting at one end with one binding post, passing perpendicularly upwards on the inner side of the body of the instrument, then crossing horizontally beneath the needle and downwards again on the other side, and connecting with the other binding post. When it is desired to pass the current through this bar—which will give amperes of current by action upon the needle—the plug should be in the position represented in the figure.

Place the instrument so that the line, passing through the zero points, is in the magnetic meridian. If the needle point does not correspond to zero when the zero of the vernier corresponds with that of the circle, loosen the milled-head screw on the side of the flange which carries the annular magnet, and, steadily holding the carrying-ring by the milled-head screw under the flange, move the flange which carries the field magnet until the needle point corresponds with the zeros of the graduated ring and vernier, tighten the screw and then throw in the current by means of the binding posts, then move the flange by means of the milled-heads beneath it until the needle, which has been deflected by the current, is brought back to the zero of the main circle. The reading is then taken from the position of the vernier upon the circle. If at the lowest position of the head of the instrument, one degree on the circle represents one volt or one ampere, it has a range of 45 volts or amperes. If the head of the instrument be raised so that one degree represents five volts or amperes, then the range is increased to 225 volts or amperes, etc., etc. A vertical graduated scale enables the operator to set the instrument for any desired range. A table is supplied with each instrument, showing the different positions corresponding to different ranges. The connecting plug represented on the left of the engraving is changed from one hole to the other, according to the requirements of the work. In the position represented, the instrument would give amperes of current. If changed to the other hole, electromotive force in volts will be indicated. On the right side of the engraving a reversing switch is represented, by means of which opposite readings may be taken.

The diameter is of the same form and general construction exclusive of the bobbin of fine wire. The volt-meter is also of the same form, but without the bar of copper.

In these instruments the deflection of the needle, it must be remembered, does not indicate accurately the tension, or strength of current, but the amount of motion of the annular field magnet required to bring the needed pointers back to zero, gives by direct reading, the current strength or electromotive force.

Smaller and cheaper forms of these instruments are made limited in range generally to 45 volts and 45 amperes.

To the electro-plater these instruments—especially the am-meters—are invaluable. Knowing, as we do, the electro-chemical equivalent of the different metals, the exact amount of any given metal that can be deposited per hour, with a given current, is readily determined. The am-meter, when in circuit, will indicate this. The following is a table of the electro-chemical equivalents of the metals usually involved in electro-plating, and the amount deposited per hour for each ampere of current.

| | Electro-chemical equivalent. | Metal deposited per hour for each ampere. |
|---|---|---|
| Copper | .3307 | 18⅜ grains. |
| Nickel | .3097 | 17½ " |
| Silver | 1.134 | 66 " |
| Zinc | .3412 | 18 " |
| Tin | .3097 | 17½ " |

If the am-meter be put in circuit with one of the conductors leading to the bath, and the deflection of the needle reduced to zero by rotating the ring, the position of the ring pointer will indicate, in divisions of the circle, the number of amperes of current passing through the solution, and consequently the work done. If the ring magnet be moved 10 divisions, to bring the needle back to zero, it indicates the passage of 10 amperes, and the deposition of 183 grains of copper per hour, or 660 grains of silver, etc. As generally rated, the small am-meters are limited to a range of 45 amperes, corresponding to an extreme deposition of 825 grains of copper per hour. If the current used is in excess of 45 amperes, the am-meter must be rated differently. For instance, if the instrument be rated so that one degree represents two amperes, the extreme range would be 90 amperes, and a deflection of 45 degrees would indicate the deposition of 1,650 grains per hour. A deflection greater than 45 degrees involves inaccuracy; therefore the action of these instruments must be kept within the limit. It is, of course, necessary that the bath be in the proper condition. An excessive evolution of hydrogen at the cathode would vitiate the result. The volt-meter should be used occasionally to determine whether the electro-motive force of the current used is suited to the work to be done. Brass and nickel plating requires higher electro-motive force than copper and silver. The am-meter may be kept continually in circuit, without interfering with the work, as it adds practically no resistance.

### The Police Visual Signal.

The combination of the telephone and telegraph an an auxiliary to the police department, after a trial of not to exceed six years in many of the largest cities of the United States, has passed its experimental stage, and is to-day so satisfactory in its results, that its more general adoption is now under consideration.

The latest invention in this connection is the Brewer and Smith Visual Signal which, combined with the signal call box and the telephone, the electric system as applied to police work has many times doubled in its practical and efficient usefulness.

This signal, the invention of detective Jas. P. Brewer and Wm. C. Smith, Supt. of Fire Alarm Telegraph of New Haven, Conn., was practically suggested by the difficulty in the rapid transmission of important information to patrolmen on their beats.

Police Visual Signal.

Two features of the invention are simplicity in the device and the certainty and silence of its action. It embraces a complete system of signal call and telephone apparatus placed in a cast iron structure, simple and unique in architectural design, forming no more of a street obstruction than the ordinary lamp post.

This signal station is about 8 feet in height, octagonal in shape, and of hollow construction; midway of the station it enlarges into a cast-iron box sufficient in size to contain a telephone and electric call box, also the apparatus for operating the signal.

On the top of this station is placed the usual public lamp, inside and above the call box is an apparatus with counterbalance weights, which hold in position a concealed glass globe of red or any other color. Radiating from each station house are telegraph lines running through to these signal box stations, either separately or in circuits. By the touch of an electric button, at headquarters, an armature is released, and the red globe at once rises from inside the alarm box which encircles the gas or electric light. The change of color is seen by night on a street for a long distance, and in the daylight the colored signal can be seen for some blocks. The patrolman on his beat is thus notified that communication with headquarters is desired, and promptly responds through the telephone from the signal station to which the signal alarm has called him. After communicating, the colored glass globe is allowed to drop to its place of concealment. In the same manner the central office can communicate to any patrolman on his beat, he can summon assistance from any adjoining beat, by opening the iron box, and by a touch, releasing the armature, which controls the ascent of the colored glass.

In locating these signal stations, they should be placed at the intersection of regular beats, so that officers approaching from either one or all directions can see it. In their operation they make no noise, tell no secrets except to the proper persons, and greatly facilitate quick police work.

The merit of the invention can better be understood by a few practical illustrations. It is reported at headquarters that a horse and wagon has been stolen from some part of the city. Red alarm lights are immediately shown at railroad stations and steamboat docks, and on all avenues leading out of the city, descriptions and orders given to stop the team and arrest the driver. This will naturally follow, for every avenue of escape is guarded within a few minutes of the reported theft of the property. Again: A warrant is left at headquarters for the arrest of a well-known tough or crook. This circumstance is not known to any of the officers on their beats, until they are summoned by the red signal lights to the alarm boxes, when they are told by telephone of the existence of the warrant. The first officer who sees the wanted man makes the arrest.

One important effect of the use of this invention is this: A store is found open at night. The officer telephones the fact and also that he is keeping guard there until relieved. The proprietor of the store lives at a great distance from his place of business. The usual plan has been to dispatch a man to relieve the officer watching the store, and a man to the house of the proprietor; but the red light attracts the attention of the officer on the beat near the residence of the owner of the store, he goes to the alarm box and is ordered to notify the person whose store has been left opened. Thus no officer is taken from his beat and much time is saved.

Suppose a man telephones to the central office at night that burglars have made an unsuccessful attempt on his house, and he suspects their proximity in his neighborhood; without noise and in a moment signals are put up on all beats in that neighborhood, by a mere touch at the main office; the officers warned, so cover the immediate district that no burglars can escape. The silence of the alarm is a grand element in all such cases. This device can be attached to the present police call system, or can be worked by itself. It works with no extra cost for light. The apparatus is not exposed to the weather and is not liable to be broken. One officer can signal to another, without notifying the central office. He can talk to the officer on the next beat by a system of signals raising and lowering the light. Should the matter be urgent, the rapid flashes of the red light convey the fact intelligently. It is so simple that any officer can work the signals.

In New Haven five men are allotted to attend a fire; should more be needed, one of them notifies the headquarters. Instead of sending the sergeant to gather the number of men required, they are summoned by means of the signal, from beats near the fire or from where they can be best spared.

—— It is proposed to strengthen the defenses of Cherbourg by providing two fixed electric lights which shall illuminate the channels upon either side of the breakwater within which the arsenal and fortifications are situated.

## On an Electric Motor Phenomenon.

By W. M. Mordey, British Association.

About fifteen months ago, on the occasion of running and testing a Victoria electric motor in the works of the Anglo-American Brush Electric Light Corporation, an unexpected phenomenon was observed to the writer and his assistant, Mr. Watson. The motor was a 30 horse-power series wound high-tension machine, constructed to work with a current of 20 amperes. When the driving generator (a large Brush machine wound for 20 amperes) was started, the motor connected in the circuit also started, but ran slowly, and developed but little power. As there was apparently some fault in the connections, or elsewhere, it was necessary to examine the machine and circuit. In order to stop the motor, the circuit was broken by taking one of the leads out of the terminal to which it was connected. On doing this, the motor, which at the time was running slowly in the usual direction, stopped suddenly, and instantly ran backwards—*i. e.*, in a direction reverse to that which was usual, at a rate of speed rather greater than its former forward rotation, slowly decreasing in speed until it stopped. It appeared at the first glance as if some connection still existed with the generator, but this was not the case, and it became evident that the machine contained within itself the cause of this behavior. An examination of the circuit revealed the fact that the fields of the motor, instead of being joined in series with the armature, had, by mistake, been placed as a shunt across it. Otherwise, everything was in proper order. When the connections were put right, the motor ran without any unusual feature.

In considering the action to find the cause of the reversal, it will be seen in the first place that the slow speed at which the motor ran when connected with the generator was the result of the smallness of the current in the armature. The winding being intended for a series connection, the resistance of the fields was comparatively low, and when the armature and fields were connected in parallel, almost a normal field was produced, the armature receiving only a small portion of the current. To understand what took place when the circuit of the generator was opened, it is only necessary to consider the case of any shunt motor. We know that when a motor is running, its E.M.F. is, as it were, always trying to send a current in an opposite direction to that which is being forced through its armature. On cutting off the supply of current, this opposing E.M.F. is able to assert itself, and the motor becomes converted into a generator, the momentum of the armature and of any machinery that is being driven keeping up the motion for a short time, and causing the armature to generate a current, which circulates through the armature and fields. In fact, the shunt motor under such conditions acts like a series generator with its terminals short-circuited, the momentum of the armature and of any connected machinery being quickly exhausted, and the armature coming to rest. The intensity of this breaking action depends to some extent upon the form of the "characteristic" of the machine when working as a generator. Properly constructed shunt motors, having fields wound to a comparatively high resistance, do not show this action to any marked degree, unless a suitable external circuit is provided, because the high resistance of the field circuit prevents the generation of more than a small current; and shunt motors, which are incapable of acting as shunt generators, do not exhibit it at all. But most machines which are provided with shunt fields, the resistance of which is low, show it very clearly, and in a series machine on short circuit—that is to say, working merely through its own low resistance fields, as in this case—the action may be very strong, especially if the generating "characteristic" is not readily made to drop. Thus the armature is quickly brought to rest. But this does not explain why, when it had actually stopped, the armature started again in the opposite direction with a considerable velocity. * * *

It may be of interest to add that the motor in question has for several months been working very successfully in New Zealand, where it is used to supply power to the machinery at the Phœnix Gold Mine. The current is generated by Brush dynamos driven by water-power at a considerable distance from the mine, and is conducted to the motor by means of a copper wire the size of an ordinary telegraph wire (.165 in. in diameter) supported on poles. The total length of the conductor is six miles.

This is a case of the installation, amongst the mountains of a remote colony, of apparatus by which 30 horse-power is being transmitted by a wire, of which five miles weigh less than a ton, with an effective useful return of over 65 per cent., no skilled labor being supplied or required. There is nothing in this instance of transmission which scientific men can regard as novel, but it is an eminently practical one, and I may, perhaps, therefore be permitted to draw attention to it in this place, because, although a great deal has been written as to the possibilities of the electrical transmission of power, there is still a scarcely-conceded skepticism on the subject.

It had been proposed to utilize the breaking power of motors by turning their momentum to account for the purpose of stopping them. I do not think this should be done. If power is to be wasted, by all means waste it in the brake block, or somewhere where it can do no harm, and not in a dynamo where excessive and sudden loads are very objectionable. Only in two cases would I recommend the use of motors as generator brakes. First, where a collision or accident of some kind could thereby be prevented, and, second, where the power generated could be utilized, and not simply wasted in heating the machine.

While speaking of electrical motors another point may be mentioned which is of some interest.

In Marcel Deprez's experiments in France failure seems to have been caused by the extra currents, induced on opening the circuit of the motor, breaking through the insulation, and special precautions have been taken to reduce the current very considerably before the circuit is opened. In motors this is less necessary than in generators. It is well known that if the armature circuit of a shunt generator is opened, a very considerable arc may be formed by the continued generation of current at the moment of breaking the circuit, and by the extra current. In series of generators a similar, but perhaps more severe, effect is produced, although if suitable care in construction is taken no breach of insulation need occur. I may mention that I have frequently opened the circuit of Brush generators, giving from 2,000 to 3,000 volts and 10 amperes by withdrawing one of the wires from its terminal, and I have never broken down a machine by doing so, although the arc which has followed the wire has been fully 12 inches in length.

But what I wish to point out is the difference between the behavior of a shunt generator and a shunt motor if the armature circuit is opened. In the case of the former, a very severe arc may be formed, as everybody knows who has lifted one of the brushes when such a machine was running. But in the latter case—that of a shunt motor—one of the brushes may be removed from the commutator with the formation of only a very small arc. It will readily be seen why this is so. In the motor armature there is an opposing E.M.F. very nearly equal to the supplying E.M.F., and consequently the extra current effect is greatly subdued, any extra current from the line passing through the field magnet coils.

The problem of how to stop a motor without first stopping the generator seems to me, therefore, to be a very simple one, and undeserving of the very elaborate and ingenious devices which have been considered necessary in connection with the very interesting experiments already alluded to which have been going on for some years in France.

To stop the current at the generator possibly requires more care, and where the machine cannot be readily stopped the excitation of the fluids should perhaps be reduced before opening the armature circuit. The case of a series motor is rather different, but is not the same as a series generator, as it is practically only the extra current from the field magnets which has to be considered.

## Diameters and Conductivity of Wire.

In Infermle machine shop they have a noon mechanical and electrical seminary. One cloudy noon the subject for discussion was the advantage of copper wire over iron for electrical purposes, and the statement was made that copper was seven times as good a conductor as iron. "Then," said Senter, "you need a copper wire only $\frac{1}{7}$ the diameter of an iron wire."

"You're wrong," said Pick, "the amount of current a wire can carry depends on the amount of metal per foot of length, or, what is the same, the area of the cross section. Now a wire $\frac{1}{7}$ diameter would have only $\frac{1}{49}$ as much metal and would obviously not be equal to the iron wire." He turned to the blacksmith and asked: "How does one inch iron compare with two inch iron in weight?"

"The two inch iron weighs four times as much as a one inch diameter piece of the same length."

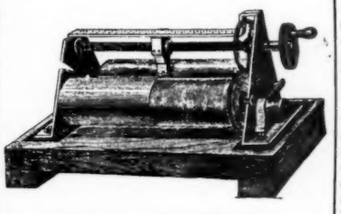
"Doubling the diameter," said Pick, "gives four times the weight, increasing the diameter three times gives nine times the weight. So a copper wire a little less than $\frac{1}{2}$ the diameter of an iron wire would have $\frac{1}{4}$ the amount of metal per foot, but being seven times as good a conductor, would carry the current as well as the iron wire."

## An Improved Wheatstone's Rheostat.

By Sir William Thomson.

Wheatstone's rheostat was invented over forty years ago; but though admirable in conception, and commonly shown on the lecture table in illustrating and explaining the nature of electric resistance, it is scarcely, if at all, used in the laboratory. This is altogether owing to practical defects in the instruments as commonly constructed. The wire comes loose, the contacts are uncertain, and, the current being incessantly broken and made again, the galvanometer needle is perpetually swinging about instead of showing a continuously increasing or diminishing deflection, as the resistance is wound out of the circuit or wound into it.

Modifications of the original instrument have been made from time to time; and a very important improvement was recently introduced by Mr. Jolin, of Bristol. In Jolin's rheostat, a toothed wheel, fixed on



New Wheatstone Rheostat.

one of the two cylinders, gears into a toothed wheel on a shaft carrying the other cylinder, and a spring fixed to this shaft acts on the last named cylinder, which surrounds it on the principle of the main-spring of a watch. By this arrangement the wire is kept tightly stretched, and the barrels can be turned both forwards and backwards, by means of a handle attached to one of them; and the necessity of shifting the handle from one to the other when the motion is to be reversed, is obviated.

In the improved rheostat, the spiral groove in the non conducting cylinder of previous instruments is dispensed with, and the wire is guided between the cylinders, so as to be laid on them spirally by means of a traveling nut on a long screw. The screw is turned by the handle, and carries a toothed wheel, which gears into two toothed wheels, one of which turns one of the cylinders, and the other the aerial shaft of the other cylinder, containing the watch-spring. The guiding nut is also arranged to stop the motion of the screw shaft at each end of the range, and so prevent the possibility of over-winding. It also carries an index, which moves along a graduated scale, and counts the turns of the wire on the insulating cylinder.

In Jolin's rheostat the two cylinders are geared together, as already described. The two cylinders are geared together directly and turn in contrary directions, the wire passing from the upper side of one to the under side of the other. In the new instrument, as is seen in the diagram, the toothed wheels of the two cylinders are turned in the same direction by the wheel on the screw shaft, and the wire passes horizontally from the top of one cylinder to the top of the other.

The conducting cylinder and the wire are both of platinoid, a metallic alloy having properties which make it specially suitable for the purpose. It has very high electric resistance, very small temperature variation of resistance, and it remains with its surface almost, or altogether, untarnished in the air. On account of the last named property, the contact between the wire and the conducting cylinder is as perfect as can be desired; and continuity of action, which was a great difficulty in the old form of the instrument, is absolutely complete.

## Another Electric Boat in England.

The Spark, which has recently been launched at the Royal Gunpowder Factory, Waltham Abbey, is an electric boat about 25 feet long and 5 feet beam. It was designed by the superintendent, Colonel W. H. Noble, R.A., mainly as a means of lighting up some of the powder houses in the factory, which are at a considerable distance from the dynamos used for general electric lighting purposes.

The details of construction have been worked out by Mr. Thomas Webb, the chief engineer in the gunpowder works, who has given much attention to the subject of electric lighting. The lighting and motive powers of the boat are derived from a battery of accumulator cells, stowed under cover amidships, and a small 1½ horse-power motor, which turns the shaft to which the screw propeller is attached. The accumulator cells were supplied by the Electrical Power Storage Company, of which Mr. Drake is the manager, and are those known as No. 23, S type. Each cell consists of a wooden (teak) box 7⅞ inches in length by 8¼ inches in width by 10¼ inches in height, and weighs 45 lbs. complete. Inside the box are a number of lead plates of special form surrounded by acidulated water, which is poured in through a small hole in the top of the box. Two strips of lead project about a couple of inches from the top of the box; these are the positive and negative poles, and, by attaching the positive pole of one box to the negative pole of another, and so on, a number of boxes are coupled together so as to form a battery.

When a current of electricity is passed into a battery of this construction certain chemical changes take place and the battery becomes capable of retaining, or rather absorbing, the electric energy due to such a current and of subsequently discharging or giving it out in the form of light, heat, or power as required. In fact, a certain quantity of electro-motive force is, so to speak, bottled up, and a battery of accumulator cells thus takes the place of a gasometer as regards lighting, and of a steam boiler as regards motive power. The total number of cells in Colonel Noble's boat is 30, and these are connected together as above described and stowed away under a kind of deck in the center of the boat. To charge the battery the boat is brought up one of the factory canals alongside the 'dynamo-house," and the two wires leading from this electric generator are attached respectively to the positive and negative poles of the battery. The dynamo, which is driven by a steam engine, is then started, and a charge of electricity is run into the battery until the acidulated water assumes a milky appearance and begins to give off gas bubbles. The battery has now taken in as much electromotive force as it is capable of absorbing, and the poles are disconnected from the dynamo.

The boat is now ready for use, and the poles are connected with the motor or dynamo electric discharger in the stern through a "reversing switch," controlled by a handle, which, when turned in one direction, causes the motor to act and the screw to go ahead, and in the other direction to go astern. Now, if it be desired to light up any powder house the boat is run alongside, the poles disconnected from the motor and reconnected to the wires which communicate with the electric incandescent lamps in the house. Most dangerous operations are carried on in many of these houses, and hitherto no light of any description was permitted even to approach them. The consequence was that as soon as it became dark all work had to cease. With the aid, however, of the electric light accumulator boat and special safety lamps work can now be carried on by night as well as by day. The speed of Colonel Noble's boat is from five to six knots an hour, and so far as can be judged from the trials made up to date, it is a perfect success.

ELECTRICAL REVIEW

Published at 23 Park Row.
P. O. BOX 3329.

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SUBSCRIPTION

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.

Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

EDITORIAL ANNOUNCEMENT.

Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

*We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.*

*We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.*

*Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.*

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill, will represent the REVIEW in the West

Messrs. Wm. Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, OCTOBER 9, 1886.

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The *Century* for October is as complete an issue of this popular monthly as ever appeared. The leading article, artistically illustrated, is the "Gloucester Fisheries," a stirring and seasonable article from the ever interesting pen of Mr. Franklin H. North.

An observing correspondent calls attention to the fact that an editorial note explaining why an incandescent lamp filament appears larger than it really is, which was original with the REVIEW, was copied into a New York contemporary and a Boston contemporary without credit, and asks "What is to be done about it?" We give it up. We shall endeavor to believe, however, that the omission of proper credit in the cases cited was unintentional.

The Electric Club, of New York, now numbers a membership of nearly one hundred. The interest in the club and constant increase of members has encouraged the Board of Managers in securing permanent headquarters, and a complete suite of rooms, which will be open all the time, have been leased from the Hotel Dam, Fifteenth street and Union Square, commencing October 1. Members will find at these rooms all facilities customory in leading clubs.

There is a stockholder in an electric light plant in Chicago, who will not permit his own company to run a wire through his premises.

Those were very pertinent and comprehensive queries sent out by the counsel of the Electric Light Association, which appeared in our last issue. We trust that all of our readers who have had experience with patent work will respond.

Expositions in the cities of Chicago, St. Louis, Minneapolis and other Western cities have quite generally been successful, and at each the exhibits of electrical appliances and power have been noticeable features. Electrical men are nothing if not enterprising.

It certainly cannot result to the advantage of any electric light company, incandescent or arc, to make a business of contracting to put in plants for less than cost. Such methods are not only demoralizing to electric lighting from a commercial standpoint, but are sure to result disastrously to their authors.

We are again treated to the information that the Western Union Telegraph Company is about to change hands, and that Mr. Gould is to be frozen out. It may be taken as an assumed fact that Mr. Gould will go out of Western Union when it suits his pleasure—and those who remain in may not be entirely happy.

A very broad and comprehensive challenge is published this week from the American Electric Manufacturing Company, as will be noted in our advertising columns, from which it would seem that Mr. Goff is anxious to meet his competitors to test the efficiency of their systems in comparison with his. We learn that the Bartholdi statue in our harbor, which is to be unveiled the last of this month, is to be lighted by the American system.

There is a noticeable improvement in electrical work in all sections of the country. The "temporary" workman is losing caste. Instead, we have more and more the finished work that skilled men turn out, and this is particularly noticeable in the later changes in telephone exchanges, electric light stations, and even district and telegraph offices. When it is necessary to run a bunch of insulated wires, as so often happens in multiple switchboard work, how much more satisfactory it is to the eye, and in the end more convenient and efficient, if the wires are neatly held together by a surrounding wire at short distances. No straggling wires are left, to be caught and tangled, and the work always has a finished appearance. Neatness and cleanliness are splendid features to make prominent in electrical stations and factories, and we are pleased to see that this fact is receiving increased appreciation.

An elderly Frenchman, residing in Springfield, Ohio, claims to have discovered perpetual motion. Unfortunately, the account says, an accident happened to some part of his machine, so that a conclusive demonstration cannot yet be given. Science knows, and has long known, that the problem of perpetual motion is insoluble. To intimate that this gentleman of Springfield has solved the problem is to assert that action and reaction may possibly not be equal; that two and two may possibly not make four; and so on, indefinitely; and this is nonsense. No doubt the poor Frenchman has derived a great deal of pleasure and satisfaction from his hobby, and no doubt he will go on tinkering with it to the end of the chapter, for paradoxers of his kind are utterly incapable of being set right, as is obvious when one considers that their peculiar mental condition disables them from thinking in straight lines. Probably a time will never come when there will be no cranks of this harmless character, and they are interesting studies so long as they are presented for what they really are.

A dispute has arisen as to the height of the iron tower, which is to be the feature of the Paris Exposition of 1889. It was originally proposed to run it up 1,500 feet; but it is objected that it would dwarf every other structure in Paris. A test is to be made by sending up a captive balloon to the proposed height and suspending therefrom four cables, which will represent the four edges of the tower, flags being affixed to mark the positions of the several stories. All the estimates for the construction have just been completed. The cost is to amount to 7,500,000 francs, the State contributing 1,500,000 francs, and the contractors furnishing the remainidg 6,000,000 francs, in return for which they are to have the revenues derived from the tower for the next twenty years.

A gentleman well known in scientific circles lately returned from Europe, in speaking of the relative progress of electric lighting in England and the United States, expresses the opinion that while not much has been done on a large scale in the way of installations for general distribution of electric current in the cities and towns of England, still the growth is an extremely healthy one. The number of installations in private residences is extremely large. Especially successful are numerous storage battery plants, the motive power for the dynamo being usually a gas engine. It is a matter of regret that more attention has not been given in this country to domestic incandescent installations.

## *ELECTRIC LIGHTING IN SPAIN.*

From our excellent Spanish contemporary, *Industria E Invenciones* we learn that the city of Gerona, in Spain, is to be almost entirely lighted by electricity and that, following the example of this enterprising though ancient town, other portions of the historical peninsula are likely in the near future to be similarly illumined. Like our own city of Rochester, Gerona is to be lighted by electricity generated by the force of the stream running through it. The power will be furnished by two turbine wheels. The hydraulic force at hand is in the neighborhood of 90 horse power, and of this 25 horse power only will be utilized. The installation will comprise 200 lamps of the incandescence type. These will be used ten hours in the twenty-four. Besides these there will be twenty arc lights of the Gramme pattern. The lamps will be fed by currents from Zipernowsky machines; the circuits of distribution, naked copper wires being suspended from the telegraph poles. In case of accident to the turbines, auxiliary steam engines are at hand to do their work. The Chamber of Commerce of Madrid, also, is now in negotiation with the "International Electrical Company" for the electrical lighting of the city. The time allowed to complete the installation will be forty days, and the price stipulated, and which has been accepted by the company, is 35 per cent. less than that now exacted by the gas syndicate. It should be said that, though the Madrid people have for some time talked about substituting electricity for gas in the streets of their city, it is not likely that electricity would have come so soon had not the controversy which has for some time been in progress between the city and the gas projectors arrived at a point where some active measure was required as at present. The Chamber of Commerce, being unable to come to any amicable understanding with the gas people, wisely took the bull by the horns, as we would say, and refused to accept the gas service at any figure, being supported in this determination by the citizens who have for some time urged the substitution of the electric light.

The municipality of Barcelona is now engaged in a series of comparative tests between gas and electrical lighting, both as to efficiency and cost, and already, though the tests are not yet concluded, so much has been learned of the superiority of electrical lighting that the city has renewed its contracts for the lighting of the various plazas and some of the public thoroughfares. There are now 96 arc lights in the streets of Barcelona.

It is interesting to observe that in several parts of Spain, notably in Andalusia, gas engines are being used instead of steam engines to operate the dynamos, and that Spanish electricians are quick to perceive the advantages of gas as a fuel and electricity as a means of lighting.

## *CHICAGO ELECTRICAL NEWS.*

A curious and astonishing result of general interest to the world at large, although not electrical, deserves a place as an item of news. Dr. M. H. Lackensteen, of this city, who is one of the most modest of physicians, is nevertheless one of the most profound students of the exact sciences. He is probably the best chemist in the State, and is also well up in electricity.

For some years past he has been practicing medicine in Chicago with excellent success, and has just become famous by his peculiar treatment of a case where it was supposed life was extinct.

The patient, a young married lady, while recovering from the effects of a recent confinement, became worse, and to all appearance died. No doubt was entertained by any one present that the spirit of the lady had fled. The body assumed all the appearances which belong to a corpse, including the rigidity of the muscular organism.

In this extremity the doctor conceived the idea of hypodermically injecting an alcoholic solution of nitro-glycerine—a thought which he at once proceeded to put in execution. The result was miraculous. In a few moments the patient showed signs of life, first by spasmodic gasps, followed by movement of the eyes, more regular breathing, and finally vocal recognition of those present. The pulse in the meantime, from sluggish, occasional beats, had run up to a rate of speed impossible to count. The patient is today alive, and, though not in perfect possession of her normal strength, able to be out, and attend to the lighter duties of domestic life.

The story has much that is fairy-like in its make-up, but the physician is one who is well known, and any person acquainted with Dr. Lackersteen, knows one who is too proud of his reputation to indulge in any deception or approve of fraud in another.

The case is attracting the most widespread attention and interest among the medical fraternity.

Nitro-glycerine has been given internally in certain cases for some time, but this is the first recorded case where this latter mode of administration has been adopted, and its use in this instance was not the result of haphazard daring, but of reasoning based on a knowledge of the action of the remedy upon the circulation.

How different this sort of knowledge and its results from that which prognosticates earthquakes and commotions of the elements and frightens the superstitious and ignorant into building platforms on which to sit and wait the awful shake, as did the Wellington family on Wiggins' Wednesday, near Hillman, Michigan. They sat there until the gnawings of physical necessity suggested something to eat, when, hearing no trumpet, seeing no blue flames, and feeling no shake, they took off their best clothes and went hungry to supper unharmed, but mentally disappointed.

Some strange stories are told of the effects of the earthquake in South Caroiina. One woman in Charleston is losing all her hair, which is beautifully long and black. The physicians say it is the result of paralysis of the scalp, caused by fright.

A physician has lately enunciated a theory which would do honor to a colored revivalist, or one of the witches in Macbeth. He says that the peril from lightning is now from three to five fold greater than it was fifty years ago, owing to the vastly increased intensity induced by the charging of the atmosphere with steam and smoke at all centers of population.

What would that class of theorist do in electricity without that poor, bamboozled and bedraggled word "charged"? It is made to do duty on every occasion, when there is uncertainty, perspicuity or indefiniteness. The ground, the wire, the machine, the air, the clouds, are constantly "charged." The use of this word is like that of the Norwegian domestic, who asked if the gun behind a boarder's door was "filled up." The speaker may know, but the hearer can only guess what is meant.

Unfortunately for the argument in the reverend gentleman's statement, those places on the globe where there is most of "the charging of the atmosphere with steam and smoke at the centers of population," are the very points where there is less electrical "charging"—and discharging—than in the sparsely settled districts, where steam and smoke do less of this wonderful charging.

The Kentucky colored preacher, who cited the increased production of lightning through the spread of telegraph, telephone and electric light wires over the country as the cause should be hunted up, and these two scientist might be able, with the apparent knwledge they have of nature's forces, to open a school of telegraphy, somewhere.

Michigan city, Goshen, and some other portions of Indiana had a wrestle with the elements on the evening of the 25th of September. The electric light people in the former place were particularly unfortunate, in that the overplus of lightning "cleaned house," for the dynamo, and left the town in darkness. In Goshen, much the same state of affairs existed for a short time, but the damage was only temporary. Advice is not always acceptable—proffered services are sometimes said to exhale an unpleasant odor. But, if it is not in this case particularly objectionable, it might be suggested in the mildest manner possible, that Sperry's ground lightning arrester is presumed to be precisely what that class of plants cannot afford to do without, if the proprietors desire to boycott this extra-territorial electricity.

For the past two or three years there have been squabbles and spasms between the members of a trio here, all about the market quotations. The parties to this electrical trinity are the Western Union and the B. and O. Telegraph Companies, the Board of Trade and the bucket shops. Unlike other trinities these were not three in one, but the reverse. During the period mentioned tickers have been removed and tickers have been replaced. Regular board of traders have kicked because quotations have leaked out, and irregular outsiders have kicked because they didn't. Pretty much every time the insiders got a chance to skin somebody there was a kick, and every time an outsider got a chance there was a rebutter kick, and the kicking was a sort of "rat-tat-too-boys," all round, so often did the kicks come from one or another of the trio.

On Friday the 1st the matter came to a head, having been referred to Judge Bagby of the Circuit Court. A test case had been agreed upon—that of the New York and Chicago Grain and Stock Exchange—which was to settle the ten or a dozen others at one fell swoop.

The judge said that even if he made an order on the Western Union to furnish the tickers with quotations, it would be inoperative, unless the Board could be compelled to furnish the telegraph company with the quotations which the tickers registered. The question of the Board being a private corporation had already been passed on by the State and Federal Courts, and he fully agreed with Judge Blodgett's views. The Board was an association of the members for their own advantage, and they were subjected to considerable expense, the collection of the quotations being a part of the same. They were not obliged to give that away as a matter of public interest any more than any other business house or private person. The telegraph companies could not be held responsible, as they were compelled to obey the orders of the board. To compel the board to give up the quotations would practically be to make it an open board, and the benefits of the association would be lost to the members. The board had a right to make its own rules, to elect and expel members, and to furnish information to outsiders or withhold it from them when it chose. It had the right to exclude any one it chose from its floor, and to send its dispatches, like any other private person, to whom it pleased. The scope of the bill was to compel the Board of Trade to discriminate against its own members. Dispatches from the board were no more public than if they were from any other association of private persons for business purposes. The injunction would therefore, have to be dissolved and the bill dismissed. An appeal was taken to the Appellate Court under a bond for $250.

Among the licenses of incorporation issued on the 2d was that of the Municipal Electric Light Company, at Chicago, with a capital stock of $60,000 Incorporators, James W. Chisholm, Richard W. Rathbone, Jr., and Alexander F. Greig.

What is to be the end of this earthquake business? It is claimed that the oil flow in Pennsylvania is decreasing, and also that the gas pressure is falling—all on account of the earthquake. The Kansas wells raised thunder generally—all on account of the earthquake. Up in Michigan sundry shallow springs, which up to the advent of the earthquake fake were doing a retail business in their own feeble way, have gone into the wholesale business. The bottoms have gone down out of sight, and cannot be reached by the longest pole available. One spring has taken to pouring a milky sort of water into Bear Lake, and has doubled the quantity of its flow—all on account of the earthquake

There is sometimes a deal of quiet amusement in tracing up the history of an electrical invention, which, it is claimed, is about to overturn the wisdom and experience of all time.

To make the point clearer, take the case of the invention of an instrument on account of which a license was granted by the Secretary of State the other day to a company with half a million of dollars capital. As an anxious hunter in the field of novelty, the writer called, in company with an Eastern newspaper man to inquire after the newborn babe, and pay our devoirs to the convalescing parent.

The party called upon proved to be one of the incorporators—the legal light of the concern. Personally he knew little about it, except that on general principles it was a great thing, and was going to astonish the scientific world. "If the gentlemen will excuse me, I will call in a party who will fully explain the whole machine." The legal light was obscured a moment by a door leading into a second room, leaving the anxious hunters or sportsmen aforesaid in mental darkness. The tread of the luminary was like that of a cat, and he closed the door as carefully and noiselessly as if warned by the upraised finger of a nurse at the bedside of a dying child. The quiet, the mystery, the wonder-land atmosphere, was not only quieting—it was stifling. We spoke with bated breath, and spit cotton until the brilliant returned to us in the same mysterious, quiet way, and a chunk of wisdom fell from his lips which dashed our hopes to earth as ruthlessly as a bar-keeper would throw a broken goblet into the alley, after the drinker had paid for it.

"Some few improvements, which experience had suggested, remained to be made, and the necessary patents applied for before it could be seen. In about a week," etc., etc. We took the next elevator down, and reaching the street felt that we were better out of the air of so much mystery, so much brilliancy, talent and ability.

"It was a typical motor crowd," my companion said, and he was right.

The inventor of that sort of apparatus is usually an offshoot from the shoe shop, the tin or the blacksmith shop, or like the farmer's son, whose father wanted him to have a place in the codfish department of a country store, because he never was good for nothin' but fishin'— they are electrically inclined because they are good for nothing else.

They are the class from whom one, once in a while, gets a letter asking for the name of some book that "tells all about electricity, as I haven't time to read a library through." They become what after a time the telephone boys call P. L. electricians. These public library electricians are wise beyond their day and generation, but it is in the wrong direction—their knowledge reaches backward. Nevertheless, they are picked up by sharpers, who organize a company—a sort of a "Quirk, Gammon & Snap" firm—capitalize the stock for fabulous amounts, with fabulous dollars, and sit back in the hole out of sight, like a spider in the garden wall, waiting for a fly.

An ignorant inventor with incurved fingers on either hand—a glib tongue with a pompous owner behind it—a legal beacon to draw the line of demarkation between legal and actionable fraud—and you have the firm of Quirk, Gammon & Snap, in the promotion of electrical inventions.

CHICAGO, Oct. 4, 1886.

## *BOSTON ELECTRICAL NEWS.*

The N. E. offices of the Consolidated Electric Light Company, P. H. Alexander, agent, have been removed from 4 Pearl to 198 Devonshire street.

Mr. C. F. West, formerly superintendent of telegraph of the Mexican Central Railroad has gone to Chicago, to act as Western representative of the Judkins Electric Railroad Signal Company.

Talking with a prominent official in Boston regarding the movement in some quarters relative to the burying of all wire, the opinion was expressed that it would be impossible in a large city to accommodate all the varying and numerous parties employing wire, in any form of underground service. There are in the city wires belonging to more than 300 different companies and individuals, and the complications that would arise if all used the same conduit, or the objections to the continual opening of the streets if many companies be allowed to place their wires underground, would be far more serious than the present trouble of overhead wires.

The Woodward Underground Telegraph and Telephone Company has been authorized to lay cables in the streets of Salem, Mass., to allow all poles and overhead wires to be removed.

The superintendent of lamps of the city of Boston, who, by way of parenthesis, receives $300 a year more salary than the superintendent of schools, has been instructed to make a three year contract for lighting the city with arc lights.

The statement that a result of the attacks upon Pearce & Zones would be an abandonment of their contract with the city of Salem, Mass., is not true. The work of preparation is going on rapidly, and will be in working order in two or three months. The circuit is to include the central station at the police office and 25 boxes.

The question of street blockades still agitates the minds of aldermen, teamsters, patrons of horse car lines, and the general public. The consolidation of the Highland & Middlesex Railroad was expected to relieve the streets in some degree, but they are about as crowded as before. Introduction of a cable system is talked to some extent, but is in general considered impracticable on account of the many curves and changing directions of the streets. The use of electric motors will be seriously considered before many months. The increased space to be obtained in the streets by the removal of horses from the tracks would do much to obviate the present crowded condition of the streets.

The Newton Electric Railway Company intend to enter upon the construction of their road at once. The routes begin at the terminus of the Cambridge street railroad and extend over Washington street to the Auburndale station—a branch connecting with the Woodland Park Hotel and the Newton Circuit Railway—the main line will be extended to Newton Center.

BOSTON, Oct. 5. F. M. G.

## Our Brussels Letter.

*Editors Electrical Review:*

The business of furnishing electric lights is increasing in this country; manufacturers appreciate the advantages of electric illumination.

One of the leading cafés at Brussels is now entirely lighted by incandescent lamps. Current is supplied by a Siemens dynamo worked by a gas engine. The light is considered good, but the installation of lamps and wires leaves something to be desired—it is ugly. The central station of the Company L'Electrique is now started by lighting the Hotel Liéjwis, a very nice installation of incandescent and arc lamps. The Café des Boulevards is splendidly illuminated with five ampere arc lamps supplied by the same station that lights also several workshops and private houses in the neighborhood.

The electrical propulsion of tram-cars is expected to be seen in daily service next month. Two cars of the Julien system are now running at the Paris exhibition of the Arts Industrielles. At the same exhibition are disposed inside and outside thirty Thomson-Houston arc lamps which operate perfectly in point of steadiness and quality of light.

I am told that an international exhibition shall be opened at Brussels in 1888. There will be a large field for display of electric light systems. A. A.

Brussels, Sept. 20, 1886.

## Telephony in Italy.

*Editors Electrical Review:*

My attention has been called to a very strange article in your edition of August 7th last, headed "Timid Italian Telephonists," in which somebody speaks about the backward state of telephony in Italy, and gives it as his opinion that "there is an excellent opportunity for enterprising men to supply a good thing." Before rushing into print, one should think the first requirement would be to post oneself thoroughly about the subject-matter. Such an elementary consideration, however, does not seem to have troubled the mind of your correspondent. Now, what is the fact? That Italy, far from being behind in telephony is, on the contrary, in the foremost rank on the European Continent. In your issue of June 5th last, there is a statistics which is apparently quite correct and shows a total of 8,340 subscribers for 16 towns (most of them small)—not a bad figure. I think, if you compare it, for instance, with France, this rich country, which, on the 1st of January last, had only a total of 7,175 subscribers, Algiers included. Instead of a lack of enterprise, there has been only too much enterprise in Italy, for in almost all the cities, two or three companies have been in hard competition, with the result that tariffs went lower and lower, until the loss to the different companies, and the pressure of the authorities who wanted, and rightly so, a simple and well organized service in the respective cities, made them think of amalgamating. This is what has been done, but with all that and though tariffs are now a little higher again, the position of all the Italian companies is anything but flourishing. No company has paid dividends yet, a consequence of the low rates, varying from $16 to $26 net a year, rates that certainly cannot prevent the public from subscribing. The difficulty for the companies is this: If in the States the wise heads of some municipalities meddle with the telephone in an unwarrantable manner, there are no less wise heads in different Governments of Europe, who, instead of helping a little this new and helpful industry, only see in the telephone a very good object for taxation. Such is especially the case in Italy, where companies are suffering hard under a multiple taxation. On the other hand, there is no possibility of obtaining concessions for interurban service even between near cities, as Governments in Italy and elsewhere do not care to have their telegraph revenues lowered—this they fear at least—and so we find in Italy only a few towns connected by telephone. If your correspondent has money to spare—I do not doubt his courage—then he should buy Italian telephone shares, there is nothing so cheap as them; for instance, a 127 francs apiece he can at present have any quantity of shares in the general Italian company, each of 100 francs—thus with a loss of 73 per cent. on the capital. That at least is better advice than his. Having, I believe, shown that your correspondent has been entirely wrong in all his premises, I may be allowed to remind him, in conclusion, of the word of the poet:

"Though modern practice differs quite,
It is just as well to think before you write."

## Telephonic News

*** The "Okonite" display at the National Telephone Convention attracted deserved attention. Mr. George Manson, a former well-known telephone man, represented the company.

*** Three leading telephone exchanges of the West are now being fitted up with the multiple switchboards—Cincinnati, San Francisco and Omaha. Life will be a more or less severe burden to the managers of these exchanges until the work is completed.

*** On the adjournment of the St. Louis Telephone Convention a large number of delegates went to Chicago, a special car and greatly reduced rates being secured over the Chicago and Alton Railway by Mr. F. W. Harrington, of the Western Electric Company. Every needed attention was shown the delegates by the C. and A. people.

*** The interior of the Kansas City Telephone Exchange is very neatly wired, the terminal board back of the switchboards, to which all the cables are brought, being a model of convenience and neatness. This work was done by Electrician Barrett, of the telephone company, and is highly creditable to his good taste and electrical skill.

*** It has been proved by practical experiment that there is no difficulty in holding telephonic communication between the West of England and London. As an experiment, half an hour's conversation has been held between Bristol and London, a distance of 120 miles. An interesting commencement in long-distance telephoning is already in working order, by which various towns having exchanges of the Western Counties Company, are linked with one another. Bristol and Bath are an instance in point. Trunk lines have been completed between the two cities, the wire distance being 13½ miles, and conversation carried on successfully over any local line in Bristol. From Worcester to Great Malvern also a line is now being run.

*** A Boston physician was called out of a sound slumber the other night to answer the telephone. "Halloo! what is it?" he asked, little pleased at the idea of leaving his comfortable bed. "Baby is crying, doctor. What shall I do?" came across the wire. "Oh! perhaps it's a pin," suggested the doctor, recognizing the voice of a young mother, one of his patients. "No," was the reply, "I'm sure it can't be that." "Perhaps he has the colic," returned the doctor, with well-simulated solicitude. "No, I don't think so," replied the anxious mother, "he doesn't act that way." "Then perhaps he's hungry," said the doctor, as a last resort. "Oh! I'll see," came across the wire, and then all was still. The doctor went back to bed and was soon asleep again. About half an hour afterward he was again awakened by the violent ringing of the telephone bell. Jumping out of bed and placing the receiver to his hear, he was cheered by the following message: "You are right, doctor; baby was hungry."

*** The Evansville *Tribune* contrasts the telephone situation in that city and Indianapolis to the latter's advantage, as follows: "The city of Indianapolis is just now wrestling with the telephone question, and are in a quandary to know exactly what to do. One thing is quite certain, that they have not cut off their nose to spite the face, as has been done in Evansville. They, no doubt, have some hot heads up there, just as we have here, but public sentiment seems to be largely tempered with good sense. At the last meeting of their Common Council a new telephone company presented a petition, announcing that they had tons of wire and poles, and were ready to commence operations. The petition also requested that the Council cut down the poles and wires of the Central Telephone Company, which had been furnishing the service. After a full discussion of the question, it was decided that the new company should first exemplify to the city that it could successfully operate its exchange, and that if it prove by its works that it had a good and valid claim to public favor, and was free from any entanglements of litigation, the Council would grant it the privilege of the city's streets and alleys to operate a new telephone. How much more sensible was this action of the Indianapolis Council than the 'backbone and brains' crowd of this city. Here we have a Council who destroy an existing public necessity before knowing of anything which could replace it. It has been an illustration of one of the proverbs of Ovid: 'The wise man thinks before he acts, but the fool acts and then thinks of what he has done.'"

### Details of the Closing of the First Telephone Hearing at Cincinnati.

"You can proceed, Governor," said Judge Jackson, leaning forward and addressing himself to ex-Senator McDonald, who had remained silent in his chair a few moments after the opening of Court. And Indiana's statesman proceeded to read the argument interrupted by the adjournment of the day preceding. Before that time Judge Thurman had waved his red bandana, figuratively speaking, in behalf of the Government. The honorable member of the Bell Company's counsel spoke from notes, which, jotted down on legal cap, he held in his right hand before him. At times while he pleaded most earnestly, he brought his left hand, the fingers thereof tightly clenched, up and down with sledge-hammer exactness and emphasis. Replying to one of Judge Thurman's allegations he said: "As a State's right Jeffersonian Democrat I agree with him. There were insinuations that the Bell Company has furnished money to run the local companies, although nothing to prove the assertion has been presented," said the ex-Senator. "Suppose the Bell Company has done that. That does not prevent the local companies from being third parties in law." Quoting a Latin phrase of the opposing counsel, he declared: "Now, I won't criticise his Latin, for I left college too long before I graduated to do that, but I do question his conclusion of law."

"Justice is generally declared to be blind," he continued; "but your honors would have to be deaf as well as blind not to know that the defendant in this case is a Massachusetts corporation. The power and grandeur of this corporation has been magnified by the learned counsel on the other side as if that fact ought to weigh against them. The offense of the American Bell Telephone Company to the Government consists in its accession by purchase patents and rights refused them." In closing Mr. McDonald said in substance if the Court decided to proceed and the play of "Hamlet" was continued with the role of "Hamlet" left out the Bell folks would remain as spectators. The question of jurisdiction would be carried to the Supreme Court should the decision of the Circuit Court be that it did have jurisdiction. A reversal of that decision by the Supreme Court would end the whole case.

Judge Jackson then thanked the counsel in the case for their courtesy, and asked for such arguments and briefs that they desire submitted at as early a day as possible. They wanted to fortify first impressions. When the Judge finished speaking Ex-Solicitor General Goode arose and said: "The Central Union Telephone Company and other sub-companies filed a demurrer questioning the right of the Government to bring suit in Columbus in June. If your honor thinks it proper to consider this demurrer before rendering your decision, we are prepared to proceed with the argument."

Judge Jackson replied that the Court declined to consider the demurrer at this time, for if the decision is reached that the Bell Company is not in the case, they would not act upon that demurrer, but dismiss the action. It would be irrelevant to discuss the other cause now, and the cause could not proceed if such a conclusion is reached. If the Bell Company is found in Ohio, then they will no doubt enter into that demurrer, and a time for hearing would be fixed for the December term at Columbus.

### Probable Isolation of Fluorine.—Decomposition of Hydrofluoric Acid by an Electric Current.

By M. H. Moissan.

In a former memoir we showed that it was possible to decompose anhydrous hydrofluoric acid by the action of an electric current. At the negative pole hydrogen collects; at the positive pole a gaseous body is disengaged, having novel properties. The experiment was performed in a platinum U tube, closed by stoppers of fluorine, and having at the upper part of each branch a small delivery tube, also of platinum. Through the stopper passes a platinum rod, which acts as electrode. The metal employed for the positive pole is an alloy containing 10 per cent. of iridium.

To obtain pure anhydrous hydrofluoric acid, we begin by preparing fluorhydrate of fluoride of potassium, taking all the precautions pointed out by M. Fremy. When the salt is obtained pure it is dried on a water bath at 100°, and the platinum capsule containing it is then placed in a vacuum in the presence of concentrated sulphuric acid, and two or three sticks of potash fused in a silver crucible. The acid and potash are renewed every morning for a fortnight, and the vacuum is kept at 2 cm. of mercury. Care must be taken during this desiccation to pulverize the salt every day in an iron mortar, so as to renew the surface. When the fluorhydrate contains no more water it falls to powder, and is then fit to serve for the preparation of fluoric acid; the fluorhydrate of fluoride of potassium, if well prepared, is much less deliquescent than the fluoride.

When the fluoride is quite dry, it is quickly introduced into a platinum alembic, which has just been dried by heating it to redness. The whole is kept at a gentle temperature for an hour or an hour and a half, so as to allow the decomposition to commence very slowly; the first portions of acid which come over are rejected, as they carry with them traces of water remaining in the salt. The platinum receiver is then attached, and the heat increased, allowing the decomposition to proceed with a certain degree of slowness. The receiver is then surrounded with a mixture of ice and salt, and from this moment all the hydrofluoric acid is condensed as a limpid liquid, boiling at 19.5°, very hygroscopic, and, as is well known, giving abundant fumes in presence of the atmospheric moisture.

During this operation the platinum U tube, dried with the greatest care, has been fixed with a cork in a cylindrical glass vessel surrounded with chloride of methyl. Up to the moment of introducing the hydrofluoric acid, the leading tubes are attached to drying tubes containing fused caustic potash. To introduce the hydrochloric acid into the apparatus, it may be absorbed through one of the lateral tubes in the receiver in which it is condensed.

In some experiments we have directly condensed the hydrofluoric acid in the U tube surrounded with chloride of methyl; but in this case care must be taken that the tubes are not clogged up by small quantities of fluoride carried over, which would infallibly lead to an explosion and projections, which are always dangerous with so corrosive a liquid.

When we have introduced in advance in the small platinum apparatus a determined amount of hydrofluoric acid cooled with chloride of methyl, in tranquil ebullition at a temperature of −23°, the current of 20 cells of Bunsen large size, arranged in series, is passed through by means of the electrodes. An ampere-meter in the circuit admits of the intensity of the current being observed.

If the hydrofluoric acid contains a small quantity of water, either by accident or design, there is always disengaged at the positive pole ozone, which has no action on crystallized silicium. In proportion as the water contained in the acid is thus decomposed, it is seen by the ampere-meter that the conductivity of the liquid rapidly decreases. With absolutely anhydrous hydrofluoric acid the current will no longer pass. In many of our experiments we have succeeded in obtaining an acid so anhydrous that a current of 25 amperes was entirely arrested.

To render the liquid conducting, we have added before each experiment a small quantity of dried and fused fluorhydrate of fluoride of potassium. In this case, decomposition proceeds in a continuous manner; we obtain at the negative pole hydrogen, and at the positive pole a regular disengagement of a colorless gas, in which crystallized silicium in the cold burns with great brilliancy, becoming fluoride of silicium. This latter gas has been collected over mercury, and accurately characterized.

Deville's adamantine boron burns in the same manner, but with more difficulty, becoming fluoride of boron. The small quantity of carbon and aluminum which it contains, impedes the combination. Arsenic and antimony in powder combine with this gaseous body with incandescence. Sulphur takes fire in it, and iodine combines with a pale flame, losing its color. We have already remarked that it decomposes cold water, producing ozone and hydrofluoric acid.

The metals are attacked with much less energy. This is due, we think, to the small quantity of metallic fluoride formed preventing the action being very deep. Iron and manganese in powder, slightly heated, burn with sparks. Organic bodies are violently attacked. A piece of cork placed near the end of the platinum tube, where the gas is evolved, immediately carbonizes and inflames. Alcohol, ether, benzol, spirit of turpentine and petroleum take fire on contact.

The gas evolved at the negative pole is hydrogen, burning with a pale flame, and producing none of these reactions.

When the experiment has lasted several hours, and there is not enough hydrofluoric acid left at the bottom of the tube to separate the two gases, they recombine in the apparatus in the cold, with violent detonation.

We have satisfied ourselves, by direct experiment, that a mixture of ozone and hydrofluoric acid produces none of the reactions described above.

It is the same with gaseous hydrofluoric acid. Finally we may add that the hydrofluoric acid employed, as well as the hydrofluorate of fluoride, were absolutely free from chlorine.

The gas obtained in our experiments is therefore either fluorine or a perfluoride of hydrogen.

New experiments are necessary to settle this last point. We hope soon to lay the results before the academy.—*Comptes Rendus*, vol. ciii., p. 202, July 19, 1886; *Chem. News*.

### Measuring Electric Currents.

The "New Current Weigher for the Absolute Determination of the Strength of an Electric Current" of Professor James Blyth, is an apparatus ingenious in its details, and is designed to measure in grammes the electro-magnetic force between two parallel circular circuits each carrying the same current. The respective wires are fixed in a groove round the edge of an annular disk of glass or brass, as thin and light, and yet as rigid, as possible; these disks form the pans of a scale. Without engravings and a lengthy description, it would be impossible to explain the apparatus, and particularly the delicate arrangement by means of which a current is led through the suspended coils so as to interfere as little as possible with the sensibility of the balance. A modification of this apparatus contains flat spirals of eleven turns each, instead of the annular disk with one turn only; both the practical construction and the calculation of this modification necessarily offer much greater difficulties, yet the labor is worth taking, since the attractions and repulsions would also be much greater.

*** Mr. Frank E. Parker, of Madison, Wis., has accepted the position of superintendent of the Wisconsin Telephone Company. Mr. Harry C. Haskins, secretary of the company, who has been "doing" Europe for two years past, is *en route* home.

### Peck's Bad Boy and His Induction Coil.

Browser had found an old shocking machine in the attic and made some batteries from tin cans which were usually given to the goat. In fact for a few days Billy was more than commonly pugnacious, because of the withdrawal of his favorite dish. He upset the parson's wife in an ash barrel, and whipped the Doctor's dog, and gave the school children a welcome holiday by blockading the teacher in her home. Browser placed his coil under the cash drawer with a switch so that he could shut it off when he wished. He first made attachment to the brass rail in front of the candy counter.

In trotted some young ones who were noted for taking two cents worth of candy for one of the coin of the country. A boy admiringly placed his hand on the rail and tried to lift the cover while Browser was attentively engaged in twirling the whiskers of the cat. "Oo—Oo—Ooh! I didn't mean to," cried the infant. Store vacated. Enter old lady with triple chin who was wont to handle everything, from candy to butter. "These peaches ain't very ripe, be they?" she inquired, with an increased elevation of her nose. Browser silent. "You don't mean to ask twenty cents a peck for them apples? It's a downright imposition." Cat jumps as Browser makes for the switch. "Law sakes, I don't believe that is real houey," she said, as she placed one hand on the rail and reached over the counter. This was more than Browser could stand. With a feeling that he was getting even for all the bother he had had, he moved the switch. "Great honey," she exclaimed, "I'm paralyzed," and showed such alacrity in running for home that Dr. Pylls, looking from his office, thought he had cured at least one patient of chronic rheumatism.

Next entered Dr. Sslescelmyanmacheu, the pastor of the church where Browser's father attended and where Browser did not, at least when he could help it. Now Browser had a grudge against the Rev. Dr., for in a meeting some time before, as Browser was quietly asking his neighbor for his jackknife, the Rev. Dr. said: "I wish the boys on the back seat would be quiet, please."

"Good morning," said the minister, in dulcet tones, "have you any beets? if so I would like one quart." And he smiled at the picture of the home missionary work done with Bear's soap in removing the dead cuticle from a small boy. But he touched the rail, and the current had been turned on. With a yell that made the community think there was a fire, he bolted out of the door. Browser was doubled up in the back room convulsed with laughter.

His father returned sooner than was expected, and leaning over the counter to lay down a basket, touched the brass rod. His face was awful to behold, so wrinkled and twisted out of shape that he might have done duty on exhibition as the missing link; and running into the back room he stumbled on his son.

"Laughing at me. I'll give you something to make you laugh." He seized a barrel stave and applied it vigorously to his son, who, in running away from the blows, stumbled upon the rail, where he remained tortured alike by the electric current and the chastisement. At last released, he was sent to bed to be fed on bread and water.

Browser turned over a new leaf—at least until his back got well, and turned himself vigorously to the study of "Electricity, a boon to the human race."

### Telephonic Induction.

Mr. Preece's paper on "Induction between Wire and Wire," before the British Association, revealed a somewhat alarming extent of electrical induction. In Gray's Inn-road a telephone wire suffered induction from a telegraph cable 80 feet below in the ground. The complaints induced Mr. Preece to arrange experiments on a larger scale. In Newcastle induction was noticeable at 3,000 feet distance. Experiments on the Durham-Darlington line, and two other parallel lines, the one 10¼ miles east, the other 5¼ miles west, proved that on a Sunday when all other traffic was stopped, a peculiar signal given on the central wires of 18 miles length could distinctly be heard at the four corners of the two other parallel wires, and moreover Morse signals were heard which could only come from a line 40 miles away. Two other lines were therefore selected; one from Newcastle, 55 miles long, with 10 wires, the other from Gretna, 40 miles long, with 17 wires, the two being about parallel and 40 miles distant from one another. The wail produced by intermittent increasing and decreasing currents by means of a special commutator in the one line was sadly audible in the other. Mr. Preece did not consider these tests conclusive evidence of induction, because earth was used as return lead, although the respective line terminals were most carefully insulated. Another series of experiments is, therefore, now being carried on, with gutta-percha wires bent so as to form squares of a side of ¼ mile length. Two such squares have been placed on the ground ¼ mile apart; and what is intrusted to a telephone inserted in the one closed circuit, can be listened to in the other. If facts of this kind become known the telephone will not gain in favor. Cables are not much better perhaps; signals given in the one cable to the Scilly Islands have been heard in the other cable half a mile away. It is further intended to carry a special double line of copper wire to Wales. Professor Silvanus Thompson objected to the term induction, which has become the household explanation for a good many different troubles. As the earth was used in Mr. Preece's tests, and perfect insulation is a practical impossibility, the line of force tapped at any two points, must necessarily indicate current variations. Mr. Preece protested against having characterized the phenomena as induction phenomena. It was remarked that at the electrical tramway line at Giant's Causeway, a telegraph wire is only 28 feet from the conductor rail, and no induction effects have ever been complained of, although the postal authorities had to be satisfied about a great many points before agreeing to have the two lines so near one another. A test experiment was further suggested. Let us take three parallel wires, the one for the signals, the other two on the same side of the first for listening with a telephone at the one terminal; if we have to deal with conduction it cannot make any difference whether or not we join the two other wires by auxiliary wires, so that they form one complete telephone circuit; if it is induction, a difference must result.

Mr. Preece further related how he had found a piece of a needle, suspected of being in his daughter's hand, when Professor Hughes' induction balance and Bell's contrivance, with which he localized the bullet in President Garfield's body, had failed. Mr. Preece strongly magnetized a steel needle of the same size as the one which had broken in his daughter's hand. Suspending this by a paper stirrup, he observed a deflection when the needle was near the hand, and succeeded in localizing the steel piece in the palm, so that an operation could be performed a fortnight after the accident, yielding a piece of the refractory needle ½ inch long.

A St. Louis special of the 15th ultimo, says that on Saturday night the 4th of September, Mr. E. H. Brown, local manager of the Western Union Telegraph Company, left the city without notifying his family or the company. The following Monday he telegraphed Superintendant L. C. Baker from Windsor, Canada, saying he was ill, and asking a vacation. His sudden departure and the direction of his flight suggested an examination of his books. While there is no positive information to that effect furnished by the telegraph people, it is intimated that there is a shortage in Mr. Brown's accounts. This of course must necessarily be quite small. He had been in the company's employ fully twenty-five years, is married and the father of several children, and owns a pleasant little home.

Whether this is a case of another good man gone wrong, or a wrong man gone for good remains to be seen.

### The Lady and the Cradle.

An ingenious woman out West lately adapted her electric sewing machine motor to rock the baby's cradle. She fastened a string to the top of the cradle and to the point of attachment of the treadle leaver with the fly wheel on the sewing machine table—but finding the machine without load worked too fast, she weighted the treadle with a couple of flat irons—result, complete success.

.... It is no uncommon thing for the electrical force emanating from a cloud to make itself felt in attractions and repulsions many miles away. Clouds resting upon the remote horizon thus frequently produce perceptible effects at distances from which the clouds themselves cannot be seen. An electrical cloud hanging a mile above the ground, acts inductively upon that ground, with considerable power. When in summer time the temperature of the earth's surface is very high, the ground moist, the air calm, and the sky clear, very copious supplies of vapor are steamed up from the ground, under the hot sunshine. Clouds, however, begin at length to gather in elevated regions of the air out of the abundance of the supply. The free electricity, which has been carried up with the vapor, is at first pretty evenly spread through the clouds; but after a time, as the electrical charge becomes more and more intense, a powerful repulsive force is in the end established between the spherules of the mist, and a very high degree of tension is at last produced at the outer surface of the cloud, where it is enveloped by insulating air, until in the end the expansive energy there becomes strong enough to occasion an outburst from the cloud. The escape of the redundant charge then appears to an observer's eye as a flash of lightning issuing from the cloud. Such, in its simplest form, is the way in which lightning is kindled in the storm cloud.

.... British operators are to be found in all quarters of the globe, much to the surprise of outsiders, who wonder why natives cannot be trained to take charge of cable circuits. The English merchant of to-day does not fully appreciate the wonderful system of submarine intercommunication which is always at his service; but old city men know well enough the annoyances and losses caused through native operators when their messages had to be handed from one Government to another, before they reached their destination. Nearly a quarter of a century ago eight days' delay on Indian messages was quite common. Telegrams that had to pass through Turkey were thrust aside at Constantinople until the turbaned telegraphists had cleared their lines, and their work of mutilation often cost the British merchant his message and the price of a "repeat," when the receiver was unable to translate the mangled English delivered to him in Bombay or Calcutta. Now all is changed, says the London *Telegraphist*. English operators proceed to foreign stations, and in the most unhealthy climates manfully do their duty. Multilated messages are no longer common. The delay is reduced to a minimum, and the merchants of this country reap the benefit of the employment of British operators at extra-European stations. The other day we were asked why half-bred Spaniards could not be trained to take appointments at such places as Vera Cruz and Panama, where Englishmen cannot live. The real Spaniard does not make a model telegraphist. What the Mexican operator would be like we will not venture to suggest. We have heard on good authority that it is nothing unusual for a Spanish telegraphist to give MQ (wait) while he saunters to a neighboring restaurant to indulge in a café and a cigarette—returning to go on with his work when he has finished his refreshments. It is no matter for surprise that cable companies are glad to secure English operators to do their work, for they know that Englishmen do their duty, and never forsake their posts while they have a leg to stand upon.

## TELEGRAPHIC

.... The Mexico journals are agitating for the removal of overhead wires from the streets of the capital.

.... It is reported that the Milwaukee and St. Paul Railroad Company has adopted the Edison system of telegraphing from moving trains, and will put it in operation on its White line.

.... Rhody Carroll, an employe of the Western Union Telegraph Company, was fatally injured at Detroit last week, from a shock received from a wire of the electric light company.

.... Mr. Geo. M. Meyers, general manager of the Pacific Mutual Telegraph Co., Kansas City, reports the business of his company continually increasing. The territory covered by this lively Western company gives it a good patronage.

.... A new telegraphic cable is now being laid between Ireland and England, to connect Dublin and London by a fresh route. The steamship "Monarch" has already laid the Welsh shore end, which starts from Nevin in Pembrokeshire. In connection with this line a special copper wire is being run between Nevin and London.

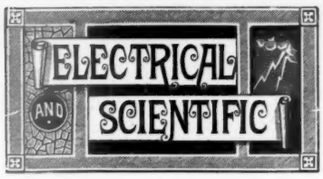
.... The United Lines Telegraph Company has opened new offices at St. Paul, Minn., Duluth, Newburg, O., and Dubuque, Iowa. Four new Western wires have been strung, which will give the company increased facilities for handling Western business. It proposes also to go into Oregon, Nevada and California. The United Lines are likewise represented at Montreal, Ottawa, Perth Thorold and Port Arthur, Canada.

.... The Franco-Algerian telegraph system is being completed to Biskra, but the communication between Biskra and Tugurth and Dabila oasis, situated at a great distance to the south, is kept up by means of the optical telegraph, the sun being utilized in daytime, and at night electricity. The optical system will be always kept in operation, as it is apprehended that nomads might cut the wires.

.... During a recent thunderstorm a man named Kettle had a peculiar experience while standing in a sheltered spot at a railway station. He was wearing a steel pin in his cravat and fancied that a flash of lightning played about it and that he smelt sulphur. He, however, thought nothing of the matter until he got home, when the discovery was made that the bright steel had been turned black. The cravat, a woolen one, was singed where touched by the pin.

.... It is stated that in English Government contracts the timber now employed for telegraph poles is the Baltic red-wood, well seasoned and then creosoted. To obtain the specified quantity of 10lb. of creosote injected per square foot the fine skin which grows underneath the bark must be carefully removed by planing. The processes which require the employment of salts of zinc, copper or mercury have fallen into disuse, mainly on account of the solubility of these salts, and also owing to the rapid corrosion which they caused in the reservoir and apparatus used for injection.

.... A German scientist, Mr. Walter Hempel, has made a discovery that may lead to important consequences. He has observed that the quantity of electricity furnished by a machine increases considerably when the latter works in an atmosphere of compressed air. A machine that under ordinary atmospheric pressure produces, for instance, 15 sparks a minute when turning at 400 revolutions, produces 32 when the pressure is increased to two atmospheres. By further increasing the pressure of the surrounding air, the quantity of electricity generated increases in considerable proportions. This curious phenomenon, it is thought, might receive numerous applications.




* * An attractive advertisement, kept constantly before the people, is the best salesman that can possibly be employed.

* * The business cards of the Cleverly Electrical Works, of Philadelphia, are particularly striking and original, illustrating their new automatic electric gas lighters. The engraving is done by Bennage & Elliott, of Philadelphia.

* * The Electrical Society of Buffalo, N. Y., has elected officers as follows: President, William Finn; vice-president, G. H. Usher; treasurer, A. C. Terry; secretary, Samuel Stewart; librarian, C. C. Smith; Executive Committee, Frank Kitton, H. D. Reynolds, Madison Buell.

* * The improvements which have been made of late in the mode of discharging torpedoes by means of electrical apparatus have greatly conduced to a far higher degree of precision being attained, and with still further developments in this direction there can be little doubt that almost perfect exactitude will ultimately be reached.

* * A patent has been taken out for a galvanic plant invigorator and oxygenizer. Two plates or plugs connected by a wire are inserted in the earth of the pot on opposite sides, and when the plant is watered, a "gentle current of electricity" is produced, which decomposes the water into oxygen and hydrogen, the "former being liberated for the use of the plant."

* * A tell-tale paint for hot bearings has been brought out by Mr. H. Crookes, of Westminster chambers. When cool, or at normal temperature, it is a brilliant red; but as the temperature rises it grows darker, until at 180° Fahr. it is quite brown. As it cools, it regains its original redness. This paint should be useful for high speed machinery, especially if it will retain the remarkable property for any length of time.

* * The Detroit Electric Tower Company have incorporated themselves under the laws of the State of Michigan, for the purpose of manufacturing and selling towers, and other supports for the purpose of electric lighting, and the transacting of business therewith connected. The company has a capital stock of $50,000, and will locate its manufactory in Detroit. The stockholders are Wells W. Leggett, James L. Edson and Clarence A. Black, holding 600 shares each, and Edmund W. Pendleton, 200.

* * We learn that it is now possible to hear plants growing. At a recent meeting of the Silesian Botanical Society an apparatus was shown in which the growing plant is connected with a disk, having in its center an indicator which moves visibly, and thus, on a scale fifty times magnified, denotes the progress of growth. Disk and indicator are metal, and when brought in contact with an electric hammer, the electric current being interrupted at each of the dividing interstices of the disk, the growth of the plant is as perceptible to the ear as to the eye.

* * During 1885 there were recorded the following earthquakes in the United States and Canada: Canadian provinces, 8; New England, 5; Atlantic States, 9; Mississippi Valley, 5; Pacific Slope, 34; total, 59. During the twelve years, 1872 to 1883, there have been recorded in the United States and Canada 364 earthquakes, distributed as follows: Atlantic Slope, 147; Mississippi Valley, 66; Pacific Slope, 151. From this list it appears that in the entire area earthquakes occur on an average once in twelve days, and once a month in the Atlantic Slope. Many of these disturbances are, however, so slight as to be unperceived by the majority of the people, and it should be observed that the list is more complete in the densely-populated and frequently-shaken Atlantic Slope than in either the seldom-shaken Mississippi Valley or the sparsely-populated Pacific Slope.

## The "Industries" (London) Reward of One Hundred Guineas—Prize Competition for the Best Electromotor.

Great and rapid as has been the progress in the application of electricity for lighting purposes, its application as an agent for transmitting and converting power has hitherto not received sufficient attention. Yet this branch of electrical engineering might, if properly developed, become an industry of even greater importance than that of electric lighting, and thus afford profitable employment to a large number of workers and to a considerable amount of capital. We cannot pretend to give a complete answer to the question why transmission of power by electricity has been hitherto so much neglected, but it seems tolerably certain that one of the obstacles which at present stand in the way of a more general and practical development of the subject is the electro-motor itself. In making this assertion, we do not mean to imply that the electro-motors of the present day are imperfect machines if considered from a theoretical point of view. On the contrary, both dynamos and motors are more simple and more efficient transformers of energy than any purely mechanical device yet invented. But, from a practical point of view, they labor under the disadvantage of running at too high a speed, having too great a weight, and costing too much money.

Before we can hope to see electrical engineering, as applied to power purposes, develop into a great industry, a motor must be invented which will be moderately cheap and light, run at a slow speed, and have the same high efficiency as the heavy quick-running motors now in use. These conditions are jointly difficult to realize, although singly they have been attained by many inventors and manufacturers. There are dynamos now in the market which, when used as motors, give over 90 per cent. commercial efficiency; but these machines are heavy, and run at a very high speed. On the other hand, motors have been constructed which weigh only about 60 lbs. per horse-power; but their speed is either excessive, if the efficiency be tolerably good, or their efficiency is very bad, if the speed be only moderate. We may mention that 60 lbs. per horse-power is by no means the minimum of weight which has been reached in practice. Thus the motor made by M. Gramme for the Meudon balloon experiments weighs only 38 lbs. per horse-power, but its efficiency does not exceed 57 per cent.

When comparing different motors as regards their speed, the power developed must also be taken into account, a fixed minimum number of revolutions per minute being evidently far more easily attained with a large than with a small motor of given weight per horse power. At the same time, where power is required for practical purposes, it is generally convenient to attain it at a speed which is the smaller the larger the power, and vice versa, so that, also with a view to practical applicability, the speed and power of electromotors should vary in some inverse ratio. What the exact ratio should be must to a certain extent depend on the type of motor, and on the nature of the work for which it is intended; but as it is necessary for the purpose of a competition to fix a certain relation between power and speed, we shall assume that 250 revolutions per minute would be a convenient speed for a motor giving 10 h. p. We have in the above remarks only spoken of motors as usually constructed, *i. e.*, where the power is taken off directly from the spindle of the armature, and where, consequently, the speed of the latter is also that of the spindle from where the power is obtained. It is evident that by the introduction of some kind of speed-reducing gear we could use a small motor of high speed and yet comply with the above condition, provided the gear is sufficiently strong and simple to be of practical use. In this case the motor itself could be made very light, but the weight of the gear and of the slow running shaft from which the power is delivered would have to be added. The power wasted in the gear would also have to be taken into account when estimating the commercial efficiency of the machine.

There can be no doubt that if a strong, cheap, light, and efficient electromotor, running at moderate speed, could be invented, the whole industry of electrical engineering would be largely benefited and extended, and in order to stimulate such a development the proprietors of this journal have decided to offer a reward for the best design of a 10 h.p. motor.

We are well aware that in attempting to judge the merit of a machine from its design only, instead of from tests with machines actually made, great difficulties will be experienced; but if, in order to avoid these difficulties, we were to limit the competition to actual motors, we should prevent many a would-be competitor from devoting his talent and energy to the subject. In that case only those persons could compete who are interested in the question, and have sufficient means to build a 10 horse-power motor, and their number is exceedingly limited. It would practically be a competition between a few of the leading manufacturers. Now, it will be seen by referring to the conditions we have established as a kind of standard of excellency, which every competitor should strive to approach, that none of the ordinary motors at present in the market come anywhere near it. To reduce the thickness of a casting here, to substitute gum metal for cast iron there, or to adopt any other expedient generally resorted to for reducing the weight of machinery, will not improve matters sufficiently. Neither will the substitution of silk for cotton, or square wire for round, or any other plan for the increase of the current capacity of the motor, affect the general result to any large extent. What is wanted is not an old type lightened and improved, but a totally new type. We must have a new invention in the strictest sense of the word in order to approach the conditions laid down as the basis of this competition. The more brains are striving for it, the greater is the probability that such a new invention will be made, and for this reason we believe that our object of stimulating the industry of electrical engineering will be better served by a competition of designs open to everybody, than by one of actual machines practically limited to very few electricians.

The names of those who have kindly consented to act as jurors will be a sufficient guarantee that the designs will be honestly, carefully, and impartially examined, and that the award will, as far as lies within human discrimination, be given to that design which, taking all things into consideration, approaches nearest to the standard of excellence set up. The secrecy of competitors' names, as provided for by clause 4, is an additional guarantee of impartiality.

PARTICULARS OF THE AWARD.

1. An award of 100 guineas will be paid to the person who, being the original inventor, sends us the best design of motor, complying generally with the conditions stated below.

2. If the person to whom the award is adjudicated desires it, the proprietors will take out an English patent for him free of cost.

3. If the person to whom the award is adjudicated desires it, the proprietors will have a motor constructed, and present it to him, free of all cost.

4. The person to whom the award is adjudicated shall remain absolute proprietor of his invention and patent.

CONDITIONS OF COMPETITION.

1. Any person, not being a member of the staff of this journal, is entitled to compete.

2. Persons competing must send to the editors, on or before the 31st of December, 1886, a complete set of working drawings of their motor. The design must be for a motor of 10 h.p. actual. The drawings must be accompanied by a complete specification, setting forth the principle and details of construction, the weights and quantities to be used in the construction, horse power, speed, efficiency, current and electric pressure.

3. To insure secrecy of names, the drawings and descriptions must not be signed with the name of the competitor, but must bear an assumed name, motto, device, or other distinguishing mark.

4. A second sealed envelope containing the real name and address of the competitor must accompany each communication, and bear outside the same distinguishing mark. These envelopes will not be opened until the decision of the judges has been published in this journal.

5. The award will be adjudicated by a jury composed of the following members:—

W. H PREECE, F.R.S.;

Professor G. FORBES, M.A., F.R.S.E.;

Professor GRYLLS ADAM, M.A., F.R.S.;

and the editors of *Industries*. The jury shall have power to call in other professional assistance, if they deem it necessary.

6. The designs submitted for competition will be treated as confidential communications and will only be published with the consent of the respective competitors, the only exception being the design of the successful motor, which will be published as soon as its English patent has been secured.

7. The person to whom the award is given must enter into an undertaking to work his invention in England for at least one year before working it abroad. By the word "working" is meant the manufacture of the motor by the inventor himself or by others under his license.

THE MOTORS MUST FULFILL THE FOLLOWING CONDITIONS.

1. *General Construction.*—The motor must be a self-contained machine, requiring no special bed plate or foundation. It must be of compact and strong design, occupying little space, and be able to do the work for which it is intended, without danger of breakdown, undue wear, or other inconvenience. It must be able to stand a momentary excess of load, such as is sometimes unavoidable in rough practical work. It must be able to run continuously at full load in a room of ordinary temperature, without undue heating of any kind (whether from mechanical, magnetic, or electrical causes), and no water or other liquid (except a moderate amount of lubricant for the working parts) must be used to keep it cool. The power must be given off from one shaft only, which is to be left long enough to receive a pulley, but the weight of this pulley need not be included in the total weight. This shaft may be that of the armature, or it may receive power from the armature by some kind of gearing. In the latter case more than one armature may be used; but the gearing must form part of the motor, and its weight must be included in the total weight. The efficiency is to be taken as the ratio of the brake horse-power given off from the shaft and the electrical horse-power delivered to the terminals of the motor.

2. *Electric Pressure.*—The motor must be constructed for an electric pressure of not less than 100 and not more than 500 volts.

3. *Insulation.*—The design must admit of a perfect insulation of the electrical circuits throughout the motor.

4. *Weight.*—The total weight of the motor when in working condition must not exceed 950 lbs.

5. *Speed.*—The speed of the shaft where the power is taken off should not be more than 250 revolutions per minute.

6. *Efficiency.*—The commercial efficiency should not be less than 80 per cent.

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—— Scene: Office Gas Company.

Irate Individual—But, sir, my family has been away all the summer.

Bland Bookkeeper—The meter has registered that amount.

I. I.—Then you owe me twenty dollars—10,000 cubic feet at two dollars per thousand. The meter registered just 10,000 cubic feet less than when we went away into the country, where, thank the moon, no gas companies exist.

B. B.—It makes no difference, sir. Sometimes we run them backwards to keep them in good condition.

Irate Individual blusters, and finally pays his bill, and takes Aicke, his little boy, who was holding the nose of the office cat over a gas burner, which was not lighted, by the hand. Aicke looks up and says, "Pa, I'll sing you a song.

> The meters for gas that we have, tra la,
> May have nothing to do with the bill;
> But when one takes into one's house, tra la,
> A most inaccurate thing, tra la,
> With a caricature of a name—"

Here Aicke was given a nickel by his pa, and after trying it with his teeth, to see if it was good, ran off to buy a pea-shooter, to use against the neighbor's hens.

## Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENTS OBTAINED THEREON.

(ELEVENTH PAPER.)

1884.

309,293. Dec. 16, 1884. Filed April, 23, 1884.
Willard E. Case, Auburn, N. Y.

Relates to a process of making electrodes, consisting in first melting the material of which the electrode is to be composed—(lead and an alloy)—see U. S. Patents.

No. 289,386. Dec. 4, 1883.
No. 292,469. Jan. 29, 1884.

Second, cooling said material in a vessel heated by steam at or near the temperature of said material while in a pasty or viscid state, and stirring said material while cooling—third, pressing into suitable forms or molds. The result is a very porous electrode.

309,839. Dec. 30, 1884. Filed Aug. 10, 1882.

Certificate of addition, filed Oct. 19, 1881, French patent, No. 309,838, dated Oct. 20, 1880. (Fournier gives number of French patent as No. 141,057, Feb. 9th, 1881.)

English patent, No. 1,676. April 16, 1881.
C. A. Faure, Paris, France.

Electrodes are shown formed in a number of different ways, as vertically, horizontally, or as corrugated plates adapted to have lead foil packed in the corrugations, and which have been subjected to the action of a corroding agent, such as sulphuric acid; wire cloth with large mesh may be used.

A number of filaments twisted together to form a rope-like electrode. Perforated lead plates with the material active in the battery packed in the openings.

All forms described are claimed.

309,886. Dec. 30, 1884. Filed June 25, 1883.
W. A. Shaw, Pittsburgh, Pa.

The patent describes electrodes, formed by inserting in a flat porous casing of fabric stretched over a wooden frame an active metal, such as lead in a porous granular or pulverulent form, or mixed with small particles of solid metal, such as shot or a metallic oxide; conductors inserted into the mass are provided and may be covered by any non-oxidizable conducting body, such as carbon.

Finally the whole may be subjected to pressure to form a solid electrode. Various electrolytic solutions are mentioned.

309,939. Dec. 30, 1884. Filed Aug. 10, 1882.
English patent, No. 1,769, 1882.
C. A. Faure, Paris, France.

Describes perforated plate like-electrodes—having an active material applied mainly on the surfaces of the plates, and which fills perforations or holes therein. Parchment paper may be applied to the surfaces of the plates and each plate enveloped in a fabric bag.

A containing vessel is also described constructed of iron and lined with a coating of pitch, varnish, etc., or covered with glazed earthern ware. The electrodes are adapted to be suspended in the electrolytic liquid.

311,007. Jan. 20, 1885. Filed April 9, 1884.
Solomon Kalischer, Berlin, Germany.

The positive electrode is of lead, the negative carbon, the electrolyte a solution of the nitrate of lead, $Pb$, $N_2$, $O_6$.

Upon charging the positive electrode is peroxidized and metallic lead deposited from the solution upon the carbon plate.

311,008. Jan. 20, 1885. Filed May 17, 1884.
Solomon Kalischer, Berlin, Germany.

The positive electrode is of lead, the negative of iron, and the electrolyte a solution of the nitrate of lead, $Pb$, $N_2$, $O_6$.

311,236. Jan. 27, 1886. Filed Oct. 2, 1882.
A. K. Eaton, Brooklyn, N. Y.

Relates to a process of forming electrodes consisting of producing sponge lead, by treating red lead with acetic acid and then treating the resulting product with zinc, which precipitates the spongy lead that is mixed with peroxide of lead.

—— We are informed that Messrs. Woodhouse and Rawson have made arrangements with the Edison and Swan Electric Light Company to pay a royalty upon lamps sold by them, pending the appeal to the late action at law. If the appeal is successful, the royalty will be returned; and in any case the Edison-Swan Company will have no claim against purchasers or users of the lamps.

—— Mr. Wm. H. Baker, of this city, well-known in telegraphic circles, and recently secretary and treasurer of the American Electric Manufacturing Company, has resigned in order to avail himself of the long sought opportunity to engage in the stock brokerage business. On the 30th inst. he was elected a member of the New York Stock Exchange and has made a connection with the long established and well-known firm, Messrs. R. J. Kimball & Co., Nos. 16 and 18 Broad street, where he will be pleased to receive visits or correspondence from his friends and former associates in the electrical fraternity.

—— At a meeting of the City Council of Orange, N. J., last week, resolutions were adopted without debate, as follows: Rescinding the contract made with the Fort Wayne, Jenney Electric Light Company, authorizing the Mayor to make a contract with the Thomson-Houston Company, of Philadelphia, represented by H. W. Pope, authorizing the Mayor to contract with the Citizen's Gas Light Company, of Newark, to light the city for the next sixty days, and to give the city's receipt for two checks, of $500 each, deposited by the representatives of the Thomson-Houston Company, as security for the fulfillment of the contract. The proposition accepted is, it is stated, to light the whole city with electric lights on a contract for two years and eight months, from October 1, at $100 per year for 2,000 candle-power lights, and $95 per year for 1,200 candle-power lights,

—— The creditors of the Schuyler Electric Light Company, to the number of forty, met in Hartford last week to discuss what plans might be best to pursue for continuing the company's business without interruption. The creditors present represented nearly all the liabilities of the concern. It was shown that the liabilities, all told, are $320,000, and that the assets figured down to hard-pan basis are $475,000. This sum includes the value to the company of contracts, to fill which it now has much stock manufactured. The only difficulty now experienced by the Schuyler Company is the lack of ready capital to prosecute its large business and fill increasing orders. There was the greatest confidence manifested by the creditors in the soundness of the concern, and more or less enthusiasm for its future. Perhaps the majority of the liabilities represented are held outside of the State. It seems that there are three sources from which the Schuyler Company can procure ready capital to go ahead in its business uninterrupted. First, the creditors, many of the largest of them, are favorable toward aiding the concern themselves. Second, the stockholders are willing to increase the treasury themselves. Third, Major Byrne, of New York, stated that he represented two New Jersey capitalists who stand ready to assume all the present indebtedness of the company and furnish ready cash to prosecute the business. The meeting then chose a committee of five creditors whose duty it is to confer and select such plan as in their opinion shall best serve the interests of the company in respect to securing ready money. The committee consists of Messrs. Willard, of Holmes, Booth & Haydens, of Waterbury; Charles Fosdick, of Fitchburg, Mass.; S. E. Elmore, of this city; William C. Simons, of Springfield; S. F. Bagg, of Watertown, N. Y. This committee is not confined to any course, but is at liberty to choose one other than the three methods mentioned above. Following a general discussion this was passed unanimously:

*Resolved*, That it is the sense of this meeting that this committee should endeavor to arrange for an extension of the debts of the company or otherwise, so as to enable the company to continue in business.

—— The Brush Company (parent) of Cleveland, Ohio, is doing a much larger business than it has been doing for some time past.

—— The Bridgeport Brass Company, Bridgeport, Conn., has published a valuable and complete little treatise relating to hard-drawn copper wire, which will be sent to any address. Tables are presented giving the weight per mile of hard-drawn copper wire, resistance per mile, breaking stress, diameter in millimeters, weight of wire between poles, and the distance in feet between poles for any number of poles per mile, from twenty-five to fifty-five inclusive. These tables from such a source are of undoubted reliability, and will be found invaluable by all users of hard-drawn copper wire. Mr. H. D. Stanley, of the Bridgeport Company, prepared the tables.

—— An electric connection for chandeliers has been patented by Messrs. John P. Willets, of Jersey City, N. J., and Edwin R. Crolius, of New York city. It consists of insulated metallic rings, so held in yielding electric communication with wires carried by the swinging portion of the chandelier as to maintain an electric connection between the main line wires and the lamps, and also furnishes an auxiliary bushing of insulated material, insulating the chandelier from the gas supply pipes.

—— A phenomenon in bird life occurred Sunday night in Bay City. After 10 o'clock the air seemed filled with members of the feathered tribe. They chirped and flitted about as if in a strange land. Around the electric light tower hundreds flew in flocks and dashed toward the lamps. Without knowing the danger, they alighted upon the wire and received the electric shock. Some died instantly while others were only stunned. Dozens of the little fellows dropped to the ground. The cats of the neighborhood became aware of the slaughter of birds, and after the light was extinguished, had such a feast as they had never before experienced. When darkness prevailed the little songsters that had escaped the electric death sought refuge in the neighboring trees. There were three different varieties. One was like that of a female canary in size and appearance. Another was a very pretty blue bird of about the same size. The third was a bird of the size of an English sparrow, with breast feathers like those of a partridge and other feathers similar to the chippy's. Whence they came is a mystery. They are not natives of this climate, and were evidently out of their course. Monday at daylight there were dozens of birds on the ground in the vicinity of the electric light tower.—*Bay City Tribune.*

—— In the city of New York the Common Council has passed a resolution requesting the Gas Commission to put in through the city, as far north as 125th street, some 2,000 new arc lamps. All the avenues, even B., C. and D. are to have electric lights almost from one end to the other, every cross street from Tenth street to Fifty-ninth street, Seventy-second Eighty-sixth, Ninety-second and 125th streets, Varick, Carmine, Grand, Elizabeth, Mott, Mulberry and a host of others. The Central Park drives are to blaze with 254 lamps; Bryant Park with 16 and Mount Morris Park with 12. Paradise Park has long been entitled to one electric light, but owing to the squabbles of the Fourth Ward statesmen for the honor of procuring it, the peanut-roasters and hand-organ men have been left in darkness. The aldermen's resolution is kinder. It gives the park three lamps. The estimated total cost for these 2,062 additional arc lights is $526,840. They would displace 5,135 gas lamps. It may be said that the total number of gas lamps now lighted by the city is 23,605, and the cost of lighting and maintaining them per annum is only $527,303.61. But in spite of the cheapness of gas, it seems almost certain that the electric circuits will be enlarged greatly in a year or two. The demand for arc lamps on all the more important streets is growing steadily, and it will not be long, perhaps, before the whole island of Manhattan will be ablaze with them.

## ELECTRIC LIGHT NEWS

—— The Mendota, Ill., Electrical Light Company has increased its capital stock to $8,000.

—— Torrington, Conn., will have an electric light plant, the capital of the company being $20,000.

—— The Brookside Cotton Mills at Knoxville, Tenn., will place an electric light plant in their new cotton factory.

—— The Chattanooga Electric Light Company, of Chattanooga, Tenn., will, it is reported, enlarge its plant.

—— The Freeman Electric Light Company, Chicago, Ill., has been organized with a capital stock of $500,000. Arthur H. Chetlain, and others, incorporators.

—— The Willimantic Linen Co., Willimantic, Conn., has put up an electric light in the middle of the river near its No. 3 mill, and is at work nights repairing the dam.

—— The Brush Electric Light and Power Co., Savannah, Ga., will add the incandescent system of electric lighting and put in another boiler and engine.

—— The Iowa City Electric Light Company, Iowa City, Iowa, has been incorporated with a capital stock of $15,000. President, Moses Bloom.

—— A system of electric light is contemplated at Mt. Vernon, Ohio. W. C. Culbertson, mayor, or S. H. Peterman, president city council, are gentlemen interested.

—— The Armington & Sims Company, Providence, has more orders for its engines than at any time since it started in business. It is running nights to keep up. Its engines are for mill purposes as well as for running electric lights.

—— The electric light company of Portsmouth, N. H., is rapidly stretching its wires for lighting in all parts of the city. Mayor Eldredge states that the system will probably be in working order by October 10, provided all works well at the start.

—— The Schuyler Electric Light Company have extended their line of wires so as to embraee Ashburton avenue, from Summit street to Nepperhan avenue; and twenty-five new electric lamps have been placed in front of stores in that young business center. Their appearance is fine.—*Yonkers Statesman.*

—— The Electric Underground Company, of Chicago, appealed to the Department of Public Works for permission to tear up Madison street, between Dearborn and Clark streets, in order to discover a possible weak wire. As the street was only paved with granite blocks last month, in an excellent manner, the department decided to issue no permits for tearing up the street for at least two years.

—— An interesting electrical display was witnessed at Waupaca, Wis., during a severe thunder storm. The electric light wires which run along Main street were so heavily charged with electricity that large balls of fire were seen hanging, or suspended, in the air just below them. Occasionally, one would explode, and a number of persons in the vicinity received slight shocks.

—— In the course of his remarks on power at the last Electric Light Convention, Mr. A. F. Upton, of the Jarvis Engineering Co., Boston, said: "Taking a basis of a 100 horse-power engine with the power costing $50 a horse-power per year (and it can be made for half of that) your power will cost $5,000 per year, you can sell through motors 150 horse-power and get $150 per horse-power per year. But call it $100 per horse-power per year, and at this rate you are selling through the receivers $15,000 worth of power that only cost $5,000."

# ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPT. 28, 1886.

349,614 Automatic cut-out for electric light circuits; William Stanley, Jr., Great Barrington, Mass., assignor to George Westinghouse, Jr., Pittsburgh, Pa.

349,615 Electric generator; William Stanley, Jr., Great Barrington, Mass., assignor to George Westinghouse, Jr., Pittsburgh, Pa.

349,616 Induction coil; William Stanley, Jr., Great Barrington, Mass., assignor to George Westinghouse, Jr., Pittsburgh, Pa.

349,617 Induction coil; William Stanley, Jr., Great Barrington, Mass., assignor to George Westinghouse, Jr., Pittsburgh, Pa.

349,650 Electric synchronizer for clocks; Marshall E. Hunter, Oakland, Cal., and James H. Gerry, Brooklyn, N. Y., said Gerry assignor to said Hunter.

349,654 Electric motor; Vincent E. Keegan, Boston, Mass.

349,710 Check or ticket register apparatus; John H. Guest, Brooklyn, assignor of one-half to T. Fred. Thomas, New York, N. Y.

349,715 Electric motor; Enos T. Higham and Daniel Higham, Philadelphia, Pa., assignors of one-third to James M. Jones, same place.

349,716 Dynamo electric machine; Enos T. Higham and Daniel Higham, Philadelphia, Pa., assignors of one-third to James M. Jones, same place.

349,739 Underground conduit for electrical conductors; Charles G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Company, same place.

349,788 Insulator; Nathan T. Fitch, Chicago, Ill.

349,797 Electric subway; Julius M. Jagel, Brooklyn, N. Y.

349,809 Coupling device for electrical conductors; Charles G. Perkins, New York, N. Y., assignor to the Imperial Electric Light Company, same place.

349,839 Telephonic apparatus; Patrick Gannon, 107 St. George's road, county of Surrey, England.

349,879 Electric clock; Domingo T. Garcia, Guadalajara, Mexico.

349,893 Insulator for electrical conductors; Saml. F. McGill, Keene, N. H.

349,912 Compound wound dynamo electric machine; Elihu Thomson, Lynn, Mass.

349,926 Circuit closer for rails; William Daves, Cranstons, N. Y.

349,927 Electric railway signal; William Daves, Cranstons, N. Y.

349,945 Quadruplex telegraph; William Maver, Jr., Jersey City, N. J., assignor to the Baltimore and Ohio Telegraph Company, Baltimore, Md.

349,947 Telephone switch; Jacob F. Mehren, Chicago, Ill.

349,975 Automatic telephone exchange system; John H. Bickford, Salem, Mass., assignor of one-third to S. Fred. Smith, same place.

349,976 Automatic telephone exchange system; John H. Bickford, Salem, Mass., assignor of one-third to S. Fred. Smith, same place.

349,999 Electric arc lamp protector; George Jeffery, Detroit, Mich., assignor to T. B. Tuitt, same place.

350,000 Dynamo electric machine; Jabez Jenkins, Philadelphia, Pa.

350,003 Dynamo-electric machine; Rankin Kennedy, Paisley, county of Renfrew, assignor to David Graham, Glasgow, Scotland.

350,024 Call bell switch; Louis Townsend, Evansville, Ind., assignor of one-half to Joseph L. Bay and Wm. B. Worthen, Little Rock, Ark.

350,025 Electric motor; Roman Vogler, Oberturkheim, Wurtemburg, Germany.

350,046 Electric lamp-post; Harry M. Doubleday, New York, N. Y., and James Lyman, Middlefield, Coun., assignor of one-half to James S. Humbird and Frank S. Marr, both of Harrisburg, Pa.


**Parties Intending to purchase Electric Lighting Machinery, should consult**
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PATENTS AND PATENT CAUSES.
NEW YORK, Temple Court, and WASHINGTON, Pacific Building,
**ELECTRICAL INVENTIONS.**
A. C. FOWLER, C.E., was Examiner in the U. S. Patent Office from 1880 to 1886, in the Interference and Electrical Divisions.

**CHANGE OF ADDRESS.**
EDWARD P. THOMPSON, formerly manager of the Patent Agency of the *Electrical World* and Associate Editor, who personally prepared and prosecuted every case in patents, caveats, trade marks, etc., submitted to the above agency, has established, as sole proprietor and manager, a patent office. The future success of the business appears insured by personal testimonials of clients, and by new cases already ordered or submitted for information. A circular of testimonials will be prepared as soon as possible.
TEMPLE COURT,
Beekman Street, New York.

**PAINE & LADD,**
HALBERT E. PAINE, Late Commissioner of Patents. | STORY B. LADD.
**Attorneys in Patent Causes And Solicitors of Patents,**
WASHINGTON, D. C.

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55 South Third Street,
Philadelphia, Pa.

Fig.259
## PHOENIX GLASS COMPANY,
(Works, Water Cure, Beaver County, Penn.)
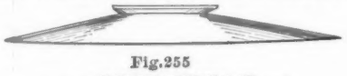
Fig.255
——MANUFACTURERS OF——
A FULL LINE OF ELECTRIC LIGHT GLOBES & SHADES, BOTH ARC AND INCANDESCENT,
In Opal, Flint and Art Glass Effects, in Opalescent and other Colors,

A. H. PATTERSON, Manager. 729 BROADWAY, COR. WAVERLEY PLACE, NEW YORK.

THE ONLY GENUINE
## LECLANCHÉ DISQUE BATTERY
IS THAT MADE BY
THE LECLANCHÉ BATTERY COMPANY.
Every Jar and Porous Cell bears the label and trade mark as shown in the cut.
All others are imitations.
DO NOT BE IMPOSED UPON.
IF DEALERS HAVE NOT THE GENUINE BATTERY. SEND DIRECT TO US FOR PRICE LIST.
None of the Imitations Compare with it in Efficiency.
THE LECLANCHÉ BATTERY CO.
149 W. 18th St., New York.

GENUINE DISQUE CELL, COMPLETE. The Porous Cell also bears Label.

GENUINE DISQUE POROUS CELL.

# Standard ✣ Electrical ✣ Works.
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## TELEGRAPH AND TELEPHONE APPARATUS,
Hotel and House Annunciators, Burglar Alarms,
CALL BELLS, "POST'S" MAGNETO BELLS,
PINS and BRACKETS, BATTERIES, &c., &c.
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IRON, STEEL and HARD-DRAWN COPPER WIRE, Delivered at Lowest Prices.
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Cincinnati, Ohio, U. S. A.

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MANUFACTURERS OF THE

BEST SYSTEM

OF

## Incandescent Lighting

ON ARC LIGHT CIRCUITS,

Posse sing a Flexib lity Equal to Low Tens'on Distribution.

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Little capital required, Most profitable investment of the day.

Rights for Sale on very Liberal Terms. Send for Full Description and Estimates.

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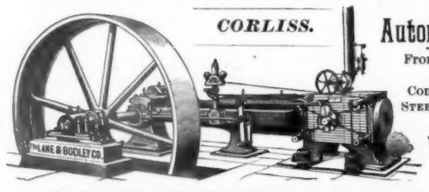


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In Plain Case Without Current Reverser.

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Made of Best Materials and in the Best Style of Workmanship.

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**Electrical Insulator, Water, Gas and Sewage Proof! Absorbs no Moisture! Frost Cannot Affect It!**

CRUSHING STRAIN, 5,500 LBS. PER SQUARE INCH—GOVERNMENT TEST.

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The 2¼-inch ducts in this Conduit are leased to different companies, which may then occupy them with such wires and cables as they may adopt. New wires may be introduced or old ones replaced through these ducts between the man-holes as shown in the cut.

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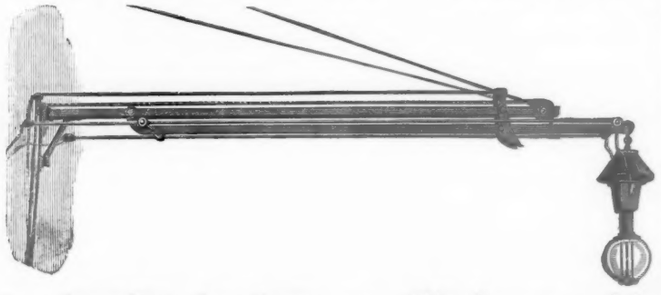

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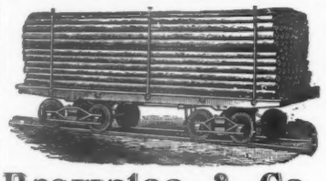

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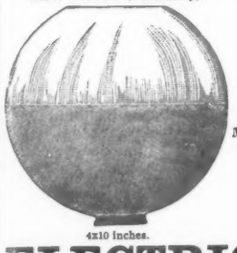

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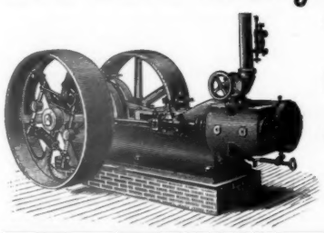

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Manufactured by this company under its increased facilities, are the finest and most popular burners of the kind made. First-class dealers throughout the country have them; and the trade will find it decidedly advantageous to handle them. Our prices will be found surprisingly low.

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FORMERLY

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We do not brag about our Carbons, but we challenge the World to produce a better.

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A Seven Conductor Cable at 5½ cents per foot.

A Ten Conductor Cable at 6½ cents per foot.

The Conductors are No. 16 B. W. gauge copper tinned wire, 7 3-2 rubber insulation.

I have also a large lot of single conductor wire of different sizes which I am selling for less than the market price and will send my list of prices on application.

Samples of the cable and wire will be sent if desired.

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New York Post Office,
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New York Ferry Co.,
Tribune Building,
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Press Club,
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Estimates made by Experts at short notice, on application at the office of the Company.

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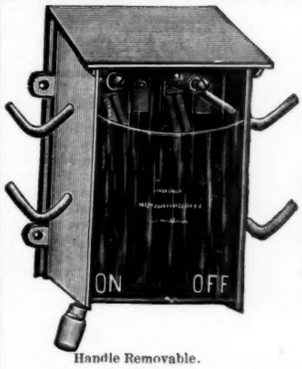


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EXPERIMENTAL WORK CAREFULLY AND PROMPTLY DONE.

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Model and Experimental work a Specialty.

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**MARKLE ENGINEERING CO.,** Detroit, Mich., **State of Michigan.**

## AMERICAN SYSTEM OF ELECTRIC ARC LIGHTING.

This system of Electric Lighting is the development of a series of inventions and discoveries of James J. Wood, Electrician of the American Electric Manufacturing Company, of New York, who has devoted himself to the discovery of new and original methods by which **an improved system of arc lighting,** with perfect automatic regulation, superior in electrical efficiency, more economical in construction and operation than other systems, could be obtained

Mr. Wood has succeeded in his efforts, and has produced a Dynamo-Electric Machine, manufactured in various sizes, with capacity of 1 to 50 lights of 2,000 candle-power each, which is superior to any Dynamo Electric Machine ever before invented, and which stands **the severest tests to which such machines can be subjected.**

Mr. Wood has also invented a set of **Lamps** which are **perfect** in their electrical and mechanical construction. In operation they are **free from hissing and frying noises,** and do not **cut out of circuit,** or allow the **carbons to slip by** and extinguish the light—defects so objectionable in other systems.

☞ The AMERICAN COMPANY cordially **invites investigation of its System by Scientists, Electricians and Mechanicians,** as well as by all who contemplate buying or using Electric Light Apparatus.

**THE SPECIAL ADVANTAGES**

claimed for the AMERICAN SYSTEM of Arc Lighting are

***THE MOST PERFECT IN PRINCIPLES OF ELECTRICAL AND MECHANICAL CONSTRUCTION.***

For **Completeness** and **Simplicity** of construction, **Durability** and **Economy** in operation, **Steadiness** and **Quality of Light** produced, and **Perfection in Automatic Regulation,**

**IT HAS NO EQUAL.**

The *Wood Automatic Regulator* is Entirely Original, Absolutely Perfect in Operation, and is the **Only Perfect Automatic Current Regulator** ever invented, the pretensions of rival companies to the contrary notwithstanding.

The Wood Automatic Regulator is the **only one** made which will permit the turning on and off of all the lights in circuit and allow the dynamo to **run any length of time on a short circuit,** or any number of Lamps—from **one** upward—on any size or capacity of machine without injury to the machine, and with corresponding diminution of power.

The cost of oil and Commutator Brushes is **reduced to a Minimum,** one set of Brushes lasting for months without readjustment.

The general care and expense of running and maintenance of the American Machine and Lamp is **far less than in any other system.**

The **absolute safety** of Armatures **from burning** (the great difficulty with other systems, and which makes maintenance so expensive), is a feature of incalculable value in the American apparatus.

The Wood Armature is now so constructed that it is **impossible for it to burn out, or for copper or other metallic dust to collect on it, to form a short circuit,** while the powerful circulation of air through the armature is not interfered with.

The Field Magnets are constructed so that it is impossible to form a short circuit that will burn them, or in any way affect the light.

The American generator occupies less space, weighs less, and requires less motive power than any other capable of producing an equal number of lights.

There is no flashing or firing of the commutator, and consequently no loss of energy and wearing of the parts from this cause. Its commutator requires no oiling, air blasts, or other attention than to be kept clean. Its extreme simplicity enables it to be operated with less skill and attention than are required by other systems.

**The foregoing are bold statements, and we are ready to substantiate them in every particular. Comparison and competitive tests with other systems of Electric Lighting is invited. We stand ready to meet any known system of Electric Arc Lighting in open and fair competitive tests, upon all points of superiority claimed for our apparatus, wherever and whenever a sale is guaranteed to the winner in the contest.**

☞ ***Local Electric Lighting, or Gas Companies, either New or Old, should INVESTIGATE THE AMERICAN SYSTEM before buying New Apparatus elsewhere.***

### A CHALLENGE.

**To All Whom it May Concern:**

**The American Electric Manufacturing Company only makes such claims regarding the superior merits of the American System as its officers are convinced can be fully maintained in open and fair competition with any known system of Electric Arc Lighting manufactured in this country.**

**With a view to having this question fairly, definitely and authoritatively settled between the various manufacturing Electric Light Companies now in the market (all of whom make statements regarding their respective apparatus which are, and always will be, more or less misleading to intending purchasers until full and complete tests are made and the results published to the world), the American Company hereby offers the following**

**CHALLENGE**

**to any and all manufacturing Companies of Electric Arc Light Apparatus in this country, to meet in a 30 days' competitive test, in all the points of superiority claimed for the American (Wood) Dynamo Machine and Lamp.**

**Each Company entering for the test to deposit the sum of $1,000 cash, in such bank as may be mutually agreed upon by the contestants, as an entry or admission fee, for the following purposes, viz:**

**1st.—Defraying the expenses of the test.**

**2d.—The Balance to belong to the winning company, which shall immediately donate it to the Charleston Sufferers.**

**This challenge is made to all Manufacturing or Parent Companies of Electric Arc Light Apparatus in the United States, but is made with especial reference to the Thomson-Houston Electric Company, of Boston, Mass. This challenge is open for 30 days, from October 1st, 1886, at the end of which time a representative of the American Company will meet the representatives of such other companies as signify to us their acceptance of this challenge for the purpose of arranging time, place and details for the competitive test.**

**AMERICAN ELECTRIC MANUFACTURING CO.,**

**NEW YORK, October 1st, 1886.**

By EDWARDS H. GOFF, *Pres't and Gen'l Manager.*

Special Attention given to installing Isolated Plants for Mills, Factories, Shops, Railroad Buildings, and other Buildings where large spaces are to be illuminated.

Estimates Furnished for building Complete Central Lighting Stations of any capacity for Electric Lighting alone, or for **Electric Lighting, combined with established or prospective Gas Plants.**

**A COMBINATION ELECTRIC LIGHT and GAS PLANT** is sensible and business-like. Some of the most prosperous and progressive Gas Companies in the world have successfully adopted this plan with the inevitable result of a much more profitable business, as well as making the gas company much more popular with its customers.

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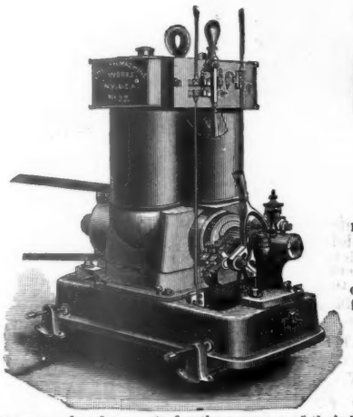
## THE ONLY PERFECT SYSTEM of ELECTRIC LIGHTING.

**MORE THAN 300,000 LAMPS IN USE.**



**Estimates for Central Station or Isolated Plants furnished on application.**

## EDISON COMPANY, for ISOLATED LIGHTING,

16 and 18 BROAD ST., NEW YORK.

The Incandescent Electric Lamp is the universally acknowledged invention of Thomas Alva Edison, and is covered by fundamental patents granted to him January 27, 1880, No. 223,898; May 4, 1880, No. 227,229; and July 20, 1880, No 230,255.

These patents, as well as some 300 additional detail and system patents, are all owned by this company.

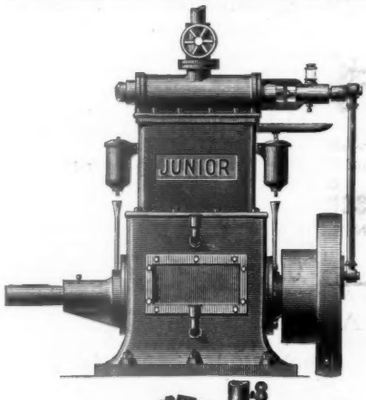
All forms of incandescent lamps as well as a great majority of the "Detail" and "System" devices offered by others than this company and its licensees, infringe the above mentioned patents, and all persons using them render themselves individually responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

### A CARD TO THE PUBLIC.

The Edison Electric Light Company having instituted suits on its patents, must decline to substitute the advertising columns of the press for the courts for the purpose of their legal interpretation. Mr. Edison's carbon filament patent of 1879 covers broadly the modern incandescent lamp. The claim that this patent has ever been in litigation in the United States Patent Office is absolutely false. In Germany and England, this fundamental patent has finally prevailed against all infringers thus establishing the fact that Mr. Edison's great invention has been nowhere anticipated; *Ergo*, a like result must follow in the United States. The straining and distorting of these facts, together with the violent effort to interweave with them certain minor and IRRELEVANT CASES for the purpose of fraudulently posing before the public as joint heirs with Mr. Edison in the fruits of these patent decisions, only indicate the DIRE EXTREMITY of those who are thus gradually becoming ENVIRONED by due process of law.

## THE EDISON ELECTRIC LIGHT COMPANY

**By EDWARD H. JOHNSON, Vice-President.**

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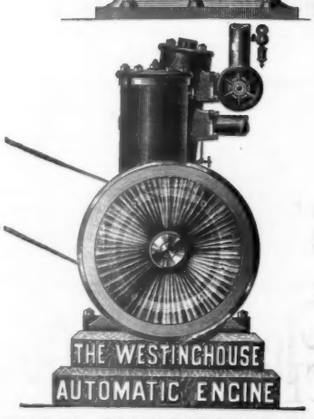

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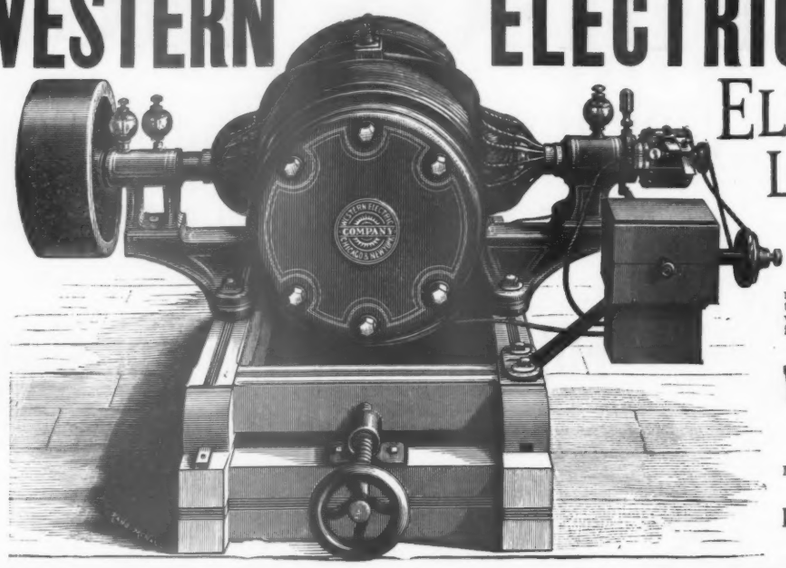

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In all desirable qualities of ELECTRIC ARC-LIGHTS, the Thomson-Houston System has no equal. The Lights are *superior in color and steadiness*, and the entire apparatus is more *economical*, *efficient* and *safe*, more *easily managed*, and *less liable to derangement* than any other.

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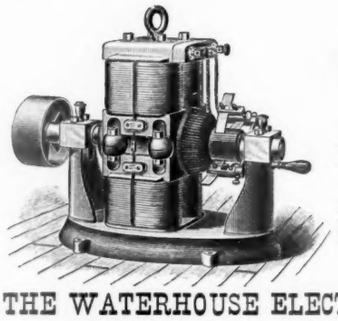

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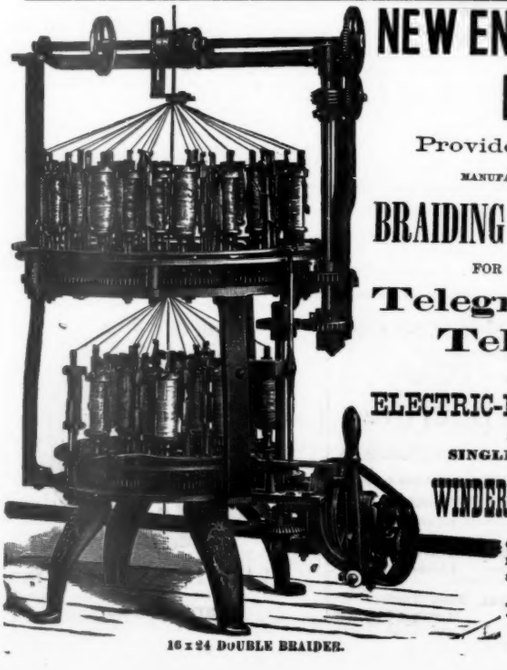

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